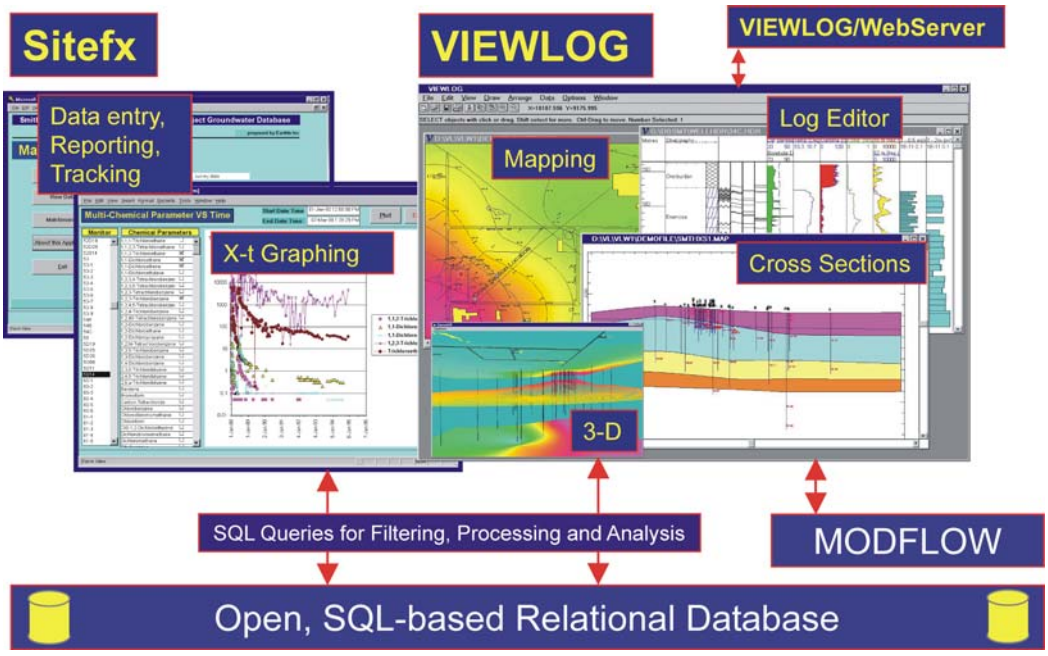
Viewlog

Borehole Data Management System



71 Cranbrooke Ave
Toronto, Ontario
Canada, M5M 1M3

Tel: 416.481.6287
Fax: 416.481.6026
www.viewlog.com

INTRODUCTION TO VIEWLOG 4

Introduction 5

Corporate Overview 5
Software Installation 5

Program Overview 13

Understanding the VIEWLOG Versions 13
Program Version Summary 14
VIEWLOG Option Modules 15
File Structure 16

Quick Start for Ground Water Modeling Users 18

VIEWLOG for Groundwater Modeling 18
Introduction to the Map Editor 20
Introduction to Data Sources 24
Introduction to VIEWLOG Grids 27
Introduction to Data Parameters 29
Introduction to Advance Mapping Options 31
Introduction to Geologic Database Management 32
Introduction to the Log Editor 33
Introduction to Log Database Connectivity 35

Quick Start for Downhole Geophysical Users 38

VIEWLOG for Downhole Geophysics 38
Introduction to the Log Editor 40
Introduction to Geologic Database Management 44
Introduction to Log Database Connectivity 45
Introduction to Geophysical Picking for Physical Rock Property Analysis 48
Introduction to Physical Properties and Multiwell Cross Plotting 49
Introduction to Auto Classification/Prediction of Physical Properties 50
Introduction to the Map Editor 51
Introduction to VIEWLOG Projects 52
Introduction to Data Sources 54
Introduction to VIEWLOG Grids 58
Introduction to Data Parameters 60
Introduction to Gridding on Section 62

GEOLOGIC MODELLING TUTORIAL 64

Introduction to Geologic Modelling Tutorial 65

Lesson 1: Getting Started in the Map Editor 68
Lesson 2: Creating a New Project and Base Map using Mapping and GIS Functions 74
Lesson 3: Introduction to Geologic Database Management 88
Lesson 4: Introduction to Data Sources 92
Lesson 5: Advanced Procedures using Data Sources 104
Lesson 6: Working with Data Parameters 117
Lesson 7: Using MS-EXCEL for Data Sources and Parameters 135
Lesson 8: Advanced Mapping Options 138
Lesson 9: Working with VIEWLOG Grids 148

Lesson 10: Exporting/Importing Grids or Parameters 151
Lesson 11: Getting Started in the Log Editor 155
Lesson 12: Correcting Log Data 164

DOWNHOLE GEOPHYSICAL TUTORIAL 173

Introduction to Downhole Geophysical Tutorial 174

Lesson 1: Getting Started in the Log Editor 178
Lesson 2: Log Data Correction 187
Lesson 3: Log Interpretation 189
Lesson 4: Introduction to Geologic Database Management 200
Lesson 5: Connecting to the Log Database 204
Lesson 6: Geophysical Picking for Physical Rock Property Analysis 214
Lesson 7: Physical Properties and Multi-Well Cross Plotting 216
Lesson 8: Auto Classification/Prediction of Physical Properties 222
Lesson 9: Getting Started with the Map Editor 225
Lesson 10: Working with VIEWLOG Projects 235
Lesson 11: Working with Data Sources 237
Lesson 12: Working with VIEWLOG Grids 253
Lesson 13: Working with Data Parameters 256
Lesson 14: Gridding on Section 267
Lesson 15: Log Data Stored as Binary files 273

VIEWLOG FUNCTIONS 276

Map Editor Commands 277

File Menu 277
Edit Menu 283
View Menu 295
Draw Menu 302
Layer Menu 304
Tools Menu 310
Project Data Menu 320
Modflow Menu 356
Options Menu 368
Window Menu 369
Help Menu 370

Log Editor Commands 371

File Menu 371
Edit Menu 387
View Menu 391
Format Menu 394
Interpret Menu 413
Options Menu 418
Window Menu 419
Help Menu 420

Multi-Well Window Commands 420

File Menu 420
View Menu 423
Options Menu 424
Regenerate Menu 431

3D Chart Control Menu 432
Interpret Menu 444
Window Menu 444

VIEWLOG WEBSERVER 446

VIEWLOG Webserver 447

Introduction 447
Overview 448
Installation – VIEWLOG Engine 449
Installation – VIEWLOG Web Pages 451
Web Structure Breakdown – vlwebserver Files 453
Configuration 456
Common Tasks 463

Introduction to VIEWLOG

Installation procedure, feature summary, and Quick Start guides.

INTRODUCTION

Corporate Overview

The VIEWLOG system is an interpretation tool for geologists, engineers and well-log analysts who work with borehole data. The system operates on a personal computer and provides complete control and analysis of well log data and three-dimensional (3-D) geologic modelling, interpretation and visualization.

VIEWLOG allows the user to edit and interpret borehole data on the computer screen and a flexible log display permits the user to modify log presentation for detailed and accurate interpretation. The program provides functions for editing, interpretation, log calculations, cross plotting, mapping, cross section generation, 3-D visualization and animation, and output to printers and plotters.

The program organizes data on a well-by-well basis; however, the user can easily select, display and correlate logs from a number of wells. The file structure is flexible, yet sufficiently structured to provide a useful database for log data, including interpretation such as lithologic boundaries and core description.

VIEWLOG allows output in either standard API format, or a user-defined, multiple-column format, which includes both logs and interpretation. The flexible column format is ideal for presenting logs from various wells. Log data may be written to computer-aided drafting systems such as AutoCAD, for further editing.

In addition to the log editing functions, VIEWLOG includes mapping, GIS and geologic modelling functions that can access a common, open database storage system. The database version of VIEWLOG has been used to manage borehole databases containing over 100,000 wells.

VIEWLOG also includes a MODFLOW management module. This module allows the user to translate geologic surfaces to MODFLOW layers in a simple, efficient manner.

The user interface to the program has been developed to provide simple, fast operation. Since the prototype version 1 was released, in 1985, user feedback has provided many valuable additions and modifications.

Software Installation

This section includes a checklist of items to review before you install VIEWLOG. This will ensure that your installation goes smoothly and that VIEWLOG is up and running as quickly as possible.

System Components

Included in the VIEWLOG package:

- VIEWLOG System disk (CDROM)
- VIEWLOG Parallel Port/USB Hardware Key
- VIEWLOG Documentation

Demo Program Package

The VIEWLOG Demo Program contains the complete software system, with the exception of the hardware key. If the hardware key is not detected on start-up, the program will operate in Demo Mode. File save, data export and printing functions are disabled in Demo Mode. All other data input and analysis functions are available.

Minimum and Recommended System Configurations

Minimum and recommended system configurations are as follows:

Equipment	Minimum	Recommended for VIEWLOG/DB	Recommended for VIEWLOG/PRO and Advanced Modules
Computer	Pentium–II	Pentium-II (266Mhz)	Pentium-III/IV (500Mhz or higher)
Computer Memory	32 MB	32 MB or more	64 MB or more
Graphics Display	VGA	SVGA or XGA	SVGA or XGA
Hard Disk Space	25 MB for the program	100 MB for program and sample files	100 MB for program and sample files
Printer	Any supported by Windows[1]	Color or monochrome printer with Raster Operations capability	Color or monochrome printer with Raster Operations capability
System Software	Windows 95	Windows 95, Windows 98, Windows NT, Windows 2000, or Windows XP	Windows NT, Windows 2000, Windows XP

Note: While pen plotters are supported, some operations, such as solid color fills, may not be available.

Note: Before you install check the VLReadme.txt file. The VLReadme.txt file can be viewed with the Windows Notepad.exe program. Before proceeding, look at the "VLW2 Readme notes" option on the CDROM Setup Menu. This information is also located in the file named VLReadme.txt in the \vlw3 directory. This file may contain updated program information that was not available when this manual was printed. The file is copied to the VIEWLOG directory during installation.

Upgrading from Previous Version(s) of VIEWLOG:

VIEWLOG 3.0 (VLW3), VIEWLOG 2.0 (VLW2) and VIEWLOG 1.0 (VLW1) can all be installed and used simultaneously on the same computer, provided they are installed in different directories.

> **Note:** DO NOT attempt to upgrade VIEWLOG for Windows while an older version of VLW is running. It is recommended that you exit and restart Windows before re-installing VIEWLOG.

Before upgrading from a previous version of VIEWLOG for Windows, you may wish to back up selected files containing user-customized parameters from the VLW Directory. The following files might be saved:

File Name	Description
Viewlog.pgt	User-defined page templates
Viewlog.lgt	User-defined log format templates
Viewlog.lsm	Lithology symbols
Viewlog.eqn	User-defined log equations
Viewlog.ini	Last file list and screen layout
Border*.map	Default map borders
Default.cfg	LAS file import defaults
Newhdr	Default header information
Viewlog *.bd	File log connectivity

These files can also be copied from the VLW1 directory into the VLW2 directory after installation of VLW2. When VLW2 finds an older format file it automatically converts it to the new format.

In addition to backing up your customized files, you may wish to disable the installation of the following groups of files during re-installation or an upgrade:

- Templates/Symbols/Borders and Equation files
- Tutorial Data Files

Unchecking these options in the Setup program will preserve your customized log format settings, user-drawn lithology symbols, user-modified map borders, custom log calculation equations and modified tutorial data files.

> **Note:** These files must have been previously installed for proper VIEWLOG upgrade operation.

Compatibility with VIEWLOG for DOS

Both VIEWLOG for DOS and VIEWLOG for Windows can be installed on the same computer at the same time; however, they should be installed in different directories. Both programs can be run simultaneously.

VIEWLOG for Windows will transparently read, using the **File*/Open*** menu item, files created by VIEWLOG for DOS Versions 4 (and earlier) and 5.

> **Note:** VIEWLOG for Windows will automatically save those files in the new Version 7.0 file format. The “VL 7.0” text string at the beginning of the HDR file can identify version 7.0 files.

In the Log Editor, the **File/*Export*** function in VIEWLOG for Windows allows you to convert information back to any earlier version. Some log formatting information may be lost and other data volume limitations may prevent full backward compatibility.

VIEWLOG Installation

The installation of VIEWLOG is fully automated. The process begins as follows:

1. Start Windows.
2. Insert the VIEWLOG CDROM and wait for the installation menu to appear, or, click on the **Start** button on the Windows task bar and select **Run**.
3. At the prompt, type the following command line: D:\setup
4. Then click **OK**. (Substitute the correct drive letter if D: is not your CDROM drive)
5. The Setup menu screen appears, then follow the prompts to proceed with the installation.

Windows NT (Versions 3.51 and 4.0), Windows 2000 Professional and Windows XP Professional

Before the installation of VIEWLOG under these operating systems, be sure to log on with Administrator privileges.

Installation of Advanced Database Drivers

Before the operation of the Database versions of VIEWLOG, it may be necessary to install updated Microsoft Windows COM Components and database drivers. These installation options are only necessary if you wish to connect to databases other than Microsoft Access (e.g., Oracle or SQLServer).

These free Microsoft software components are provided on the VIEWLOG CDROM in the identical format as provided by Microsoft, and are available as installation options under the VIEWLOG Setup Menu. They include:

6. DCOM98 (Distributed Component Object Model). This option is necessary for advanced database connection under Windows 95 and 98 only. This must be installed before MDAC.
7. MDAC (Microsoft Data Access Components). This set of drivers must be installed for Oracle, ODBC and SQL-Server access under Windows 95, 98, 2000, XP and NT4.0.

VIEWLOG Hardware Key Installation

To run VIEWLOG in a fully operational mode, the Hardware Key must be plugged into the parallel printer port/USB of the computer. The printer cable can be plugged into the other end of the software key. The key will not interfere with the operation of the printer or print spooler. It is not necessary that a printer be installed for the key to operate. The key is not required to run the Demo Program (for more information see Demo Program Package).

During VIEWLOG installation, the Activator Key Driver Installation program is automatically run. In most cases, simply select the **Express** button to install the key drivers.

> **Note:** By default, the key must be plugged into Parallel Port 1. To change the port or any other key settings, run the “VIEWLOG Key Utility” program in the

VIEWLOG 3 folder on the Start Menu. Additional instructions are found in the Readme files located in the C:\Program Files\VIEWLOG 2\SSIKey directory.

Starting VIEWLOG

Once VIEWLOG is installed, a Windows Program Manager Group will be created containing the VIEWLOG 3 Program icon. To start the program, simply select the VIEWLOG 3 menu item from the Start Menu.

Advanced users can append the name of a VIEWLOG Header file (*.hdr) (containing log data) or a Map file (*.map) to the VLW3.EXE command line to have VIEWLOG automatically load a data file on startup.

Product Registration

To receive the latest product information, we recommend that you register with VIEWLOG Systems. Simply fill out the enclosed registration form, or, send your name, address, telephone, fax and e-mail address to VIEWLOG Systems at the number listed in Technical Support.

Feature Summary

Log Editor Feature Summary

VIEWLOG offers a comprehensive suite of log analysis tools. Basic functionality includes:

Complete Control over Data Display

The user can control all aspects of the log display and scaling.

Powerful Log Editing Features

Functions are available for stretching, smoothing, trimming averaging and linking logs. Data can be edited point by point, if necessary.

Full support for the Windows Clipboard

The Cut, Copy and Paste functions can be used to re-arrange log information between log data windows. Windows Bitmaps and Metafiles can be exported to the clipboard to paste images between applications.

Integrated support for all major logging data formats

VIEWLOG supports Log ASCII Standard (LAS), Auslog, generic ASCII, Lotus 123, Colog, Robertson, OYO, OYO-RG, Geonics, Century and SMS log file formats. All formats can be loaded directly from within the main program.

Log Calculations

Any user-defined log processing equation can be entered to generate new or corrected logs. VIEWLOG also supports a wide variety of mathematical functions (sin, cos, tan, abs, etc.), conditional statements (if-then-else) and logical operators (and, or, not). Equations can be applied to the entire log or to a selected depth interval to correct only a portion of a log.

Log Digitization

Paper copies of logs can be digitized with the log digitization utility.

Lithologic Interpretation

Multiple columns of contact lines and text interpretation can be created for display next to the logs. Custom symbols can be drawn and assigned a keyword which, when it appears in the text description, results in a corresponding lithology symbol to be drawn in the lithology column.

Flexible Cross Plotting

VIEWLOG allows the user to Cross Plot any two logs, with any combination of linear and logarithmic scaling. Depth intervals are identified on the logs by either drawing polygons on the cross plot or, alternatively, pre-selecting depth intervals in the log edit window. Data from the pre-selected intervals is drawn with different symbols on the cross plot.

Powerful Z-Plots

A third log can be selected for classifying the symbols on a plot, thus creating a Z-Plot. Symbols or numbers are used to identify the Z-log value, and combine it with polygons to identify depth intervals.

Statistics

Any interval of any log can be selected for the calculation of log statistics. All statistical results appear in a grid window and can be copied to the Clipboard for integration into other Windows applications.

Correlation Matrix and Principal Components Analysis (PCA)

The correlation matrix can be calculated for any combination of logs, and, with the click of a button, the matrix eigenvalues, eigenvectors and PCA score logs can be calculated. Analysis of the PCA score logs can help understand the underlying physical properties that are influencing a suite of log measurements.

Map and Cross Section Editor Feature Summary

VIEWLOG offers a comprehensive suite of mapping and cross-section analysis tools. Basic functionality includes:

Integrated Mapping

The user can load a site map, place borehole locations, then double click on a borehole to load the log-editing window. VIEWLOG offers full support for drawing functions (lines, polylines, TrueType text, etc.), layer control, drawing order control, and import/export of AutoCAD DXF files.

Cross-Section Generation

VIEWLOG can be used to draw a cross section line on the map, and instantly project boreholes onto a cross section. The user can specify the offset distance, and all boreholes within that distance will be projected onto the section. Once the section is generated, further interpretation can be performed using all of the drawing functions listed above.

Print Preview and Output

All output passes through the integrated preview and drawing function. The user can import a company logo, mark up the output with additional lines, boxes and text, and print the final image. The drawing system allows various objects to be placed on different layers, allowing selected objects to be frozen or hidden, as needed. Control over the

drawing order allows objects to be placed above or below others, as necessary. VIEWLOG allows output to all Windows printers, Metafiles, Bitmaps, AutoCAD DXF files, and Plotcall Binary files.

Database Connectivity Feature Summary

VIEWLOG/DB and VIEWLOG/PRO connect seamlessly to a variety of database formats. This offers exceptional data management and SQL query processing based on an open, flexible database design.

Data Source Management

Borehole and monitor interval data are organized into logical groups, based on anything from borehole type to geologic monitoring interval. The flexible, open structure provides a critical framework for the management of complex four-dimensional borehole measurements.

Integrated Database Connectivity from Logs, Maps or Cross Sections

All information can be stored in the open database design, and VIEWLOG will provide meaningful data interaction through the Log and Map Editors. All database editing and updates are visible in real-time.

Geologic Modelling Feature Summary

VIEWLOG/DB and VIEWLOG/PRO provide a powerful set of tools for building complex three-dimensional geologic models, and mapping rock or fluid property variations throughout the geologic units.

Data Parameter Management

The Data Parameter structure in VIEWLOG is used to organize, build and manage objects such as formation tops, water levels, and rock properties. Parameter structures include everything from the database link to the geostatistical gridding and contouring options.

Gridding and Geostatistics

Comprehensive geostatistical interpolation functions are available for generating gridded parameters from borehole or map data. Functions for variogram analysis and modelling are also available.

Plan View and Cross Section Contouring

Full color contouring is available for parameter sets presented either on plan view or cross section. Overlaying multiple contoured parameter sets is simple; this allows for easy comparison between information sets.

Parameter Processing

Data Parameters, such as formation surfaces, can be manipulated using a number of powerful functions. These include functions for graphical browsing, numerical editing, and polygon-limited assignment. The included Surface Equation Parser allows you to write complex equations, and multiple Data Parameters can be incorporated. Equations can contain logical operators and nested If-Then-Else clauses.

Copyright Notice

The VIEWLOG software system, including utilities and documentation, are Copyright, J.D.C. Kassenaar, 1985-2004.

Software License Agreement

Licensor: J.D.C. Kassenaar

Software: VIEWLOG Computer Graphic Log Editing System

In consideration of payment, the Licensor grants the licensee a non-exclusive right to use a copy of the software on a single computer. The program may be moved between computers, however under no circumstances shall the software be used on more than one computer at the same time. The licensor reserves all rights not expressly granted to the licensee.

This agreement is not a sale of the original software or any copy. The agreement permits the use of the software by the licensee. In no event may the licensee transfer, rent, assign, lease, or otherwise dispose of the software, on a temporary or permanent basis, except with the written permission of the licensor, or as outlined in this agreement. The software may be permanently transferred to another party provided the other party agrees to accept the terms and conditions of the license agreement and all copies of the software are transferred to the new licensee.

The software and related written materials are copyrighted. Unauthorized copying of the written materials or software, including software that has had any modifications, is expressly forbidden. The licensee may be held legally responsible for any copyright infringement that is caused or encouraged by failure to abide by the terms of this license. The licensee may make copies of the software solely for backup purposes.

In no event will the licensor be held responsible for any damages arising out of the use or inability to use this software.

Technical Support

For technical support, please contact:

VIEWLOG Systems.
71 Cranbrooke Ave
Toronto, Ontario,
M5M 1M3
Canada

Tel. 416.481.6287

Fax. 416.481.0069

e-mail: support@viewlog.com

www.viewlog.com

PROGRAM OVERVIEW

Understanding the VIEWLOG Versions

		Viewlog LT	Viewlog LS	Viewlog GIS	Viewlog Pro
Data Management	Basic log import, export and merging	X	X	X	X
	Log display and reformatting	X	X	X	X
	Log Imaging	X	X	X	X
	Log Plotting	X	X	X	X
	File Save	X	X	X	X
Log Editing	Log Editing	X	X	X	X
	Log Calculations	X	X	X	X
	Log Interpretation	X	X	X	X
	DXF Data Export		X	X	X
	Log Import/Export	X	X	X	X
	On-Screen Digitizing		X		X
Log Processing	Cross Plotting		X		X
	Z-Plotting		X		X
	Log Statistics and PCA		X		X
	Sonic Log Processing		X		X
	Deviated Borehole Processing		X		X
	BHTV and Dipmeter Processing		X		X
Mapping	Drawing Editor		X	X	X
	Mapping		X	X	X
	Cross Sections		X	X	X

Open Database	Database connectivity for logs and interpretation	X		X	X
	Database connectivity for mapping and cross sections				X
Geologic Modelling	Geologic Modelling and object file management			X	X
	Geostatistics and Kriging			X	X
	Plan view color contouring			X	X
	Cross section model slicing and presentation			X	X
MODULES		**Viewlog LT**	**Viewlog LS**	**Viewlog GIS**	**Viewlog Pro**
3-D GeoExplorer				A	A
MODFLOW				A	A
Multiwell Crossplotting					A
Auto Prediction					A

*** A = Available**

Program Version Summary

Four main versions of VIEWLOG are available, including:

VIEWLOG/LT

VIEWLOG/LT provides basic geophysical log data editing and plotting. Functions for importing a wide variety of geophysical data types, interactive log editing, processing, interpretation and plotting are included.

VIEWLOG/LS

VIEWLOG/LS provides comprehensive geophysical log processing, along with mapping and stratigraphic correlation on cross sections. This version includes advanced log analysis functions such as cross-plotting, Z-Plotting, statistics, Principal Components Analysis, and deviated borehole processing. It also handles advanced log types, such as BHTV, full waveform sonic, dipmeter, and core photos.

VIEWLOG/GIS

VIEWLOG/GIS provides integrated geologic and geophysical database management, GIS, mapping and cross section analysis, all from an open relational database structure.

VIEWLOG/GIS is designed to allow meaningful, intense graphical interaction with the borehole information. (VIEWLOG/GIS does not include the advanced geophysical log analysis modules included in VIEWLOG/LS.)

VIEWLOG/PRO

VIEWLOG/PRO provides advanced geologic and geophysical data processing and modelling. This version includes all of the advanced geophysical data processing functions in VIEWLOG/LS, plus the database and geologic modelling functions in VIEWLOG/GIS.

VIEWLOG Option Modules

In addition to the different versions of VIEWLOG, there are optional modules, which can be added to the program.

3-D GeoExplorer Module

The 3-D GeoExplorer provides real-time 3-D visualization of your VIEWLOG geologic models. Because the VIEWLOG mapping and cross section analysis are already performed in a true 3-D coordinate space, generating real-time 3-D visualizations is simple with the GeoExplorer module. This module is only available as an add-on to the VIEWLOG/GIS and VIEWLOG/PRO programs.

MODFLOW Module

Generating a 3-D groundwater flow model simulation within VIEWLOG is simple with the MODFLOW module, because the native gridding and contouring techniques are fully compatible with those in the USGS MODFLOW ground water flow model. This module includes full support for the MODFLOW, MODPATH and BUDPRN flow, particle tracking and water budget analysis programs.

Multiwell Crossplotting Module

The key to interpreting multi-parameter borehole data is data integration. Spreadsheets and most graphical display packages are primarily 2-dimensional, whereas geophysical borehole data is 4-dimensional (x,y,z position and physical parameter). To achieve easy access to data in a multi-well, multi-parameter setting requires construction of a relational database. In this type of setting it becomes relatively simple to test hypotheses on the basis of physical property, depth, location, or any combination of parameters.

Physical properties can discriminate lithoclasses on the basis of discreet clusters of points on 2D, or 3D cross plots. The degree to which the points cluster versus the separation between individual cluster centroids defines the “uniqueness” of each lithoclass. 2D cross plots from single holes allow the log analyst to verify that the geophysical (lithoclass) boundaries are compatible with known geological lithological boundaries. Multi-well cross plotting allows the analyst to determine if the same discriminate parameters are applicable across the whole body.

Auto Prediction Module

One of the main features of any exploration program is the drilling of exploration holes and defining the geology of the recovered core. This is usually accomplished via diamond drilling and

can quickly account for the majority of any exploration budget. The use of reverse circulation drilling (i.e., no core recovery) can be viable alternative as the drilling expense is significantly less. However, defining the downhole geology from recovered chips can be a less-than-exact science. By initiating a downhole geophysical logging program at the onset of drilling, lithoclasses can be established and used as a method for predicting the geology in the subsequent reverse circulation holes planed in the next exploration season.

WebServer Module

The WebServer module allows VIEWLOG to dynamically display maps, cross sections and logs on an Internet or Intranet WebServer.

File Structure

The following file formats form the basis for VIEWLOG:

Well/LOG Data: HDR Files

VIEWLOG/LS:

VIEWLOG/LS creates a single Header (or hdr) file for each well. These files contain the data and formatting information for a single well. In general, the filename is the same as the well name.

While Header files contain all log formatting information and interpretation text, they do not contain the geophysical measurements. The measurements are stored in compact binary data files. All log data files related to a particular VIEWLOG header file begin with the same DOS name (maximum 8 character), yet have different DOS file extensions. For example, a particular well may include the following files:

well102.hdr = Header file for the well

well102.gam = gamma ray log data

well102.res = resistivity log data

well102.7 = data for log number 7

well102.2 = data for log number 2

The binary log data files cannot be edited with a standard ASCII editor. The binary format has been chosen for its compact size and input/output speed. The **File/*Import*** and **File/*Export*** functions can be used to convert binary log data from or to ASCII format.

If needed, log traces from various wells can be merged into a single header file using the clipboard functions (cut, copy, paste) in the VIEWLOG **Edit** menu. In VIEWLOG for DOS, this technique was used to create simplified cross sections. The cross section functions in VIEWLOG for Windows do not require that log traces be merged into one HDR file prior to cross section construction, and, in fact, work best when logs remain organized on a well-by-well basis.

VIEWLOG/GIS/PRO

When connected to a database, the HDR files act as a template for data display. The HDR file contains the database link information, plus the data display format information. Information is dynamically extracted from the database whenever a HDR file is opened.

Drawings, Maps and Cross Sections: MAP Files

Drawings, maps and cross sections are stored in files with the file extension ".MAP". MAP files frequently contain links to Windows Metafiles (*.wmf), which contain additional log-image data. For example, a cross section might be made up of the following files:

> **Sectional map =** Contains the cross section information, including stratigraphic correlation lines, and references to multiple borehole images (wmf files), including**:**
>
> > **36a.wmf =** The plot image from Well 36A, as it appears on the cross section
> >
> > **48.wmf =** The plot image from Well 48, as it appears on the cross section
> >
> > **49.wmf =** The plot image from Well 49, as it appears on the cross section

The primary advantage of this design is that the log data on the cross section can be updated simply by updating the WMF file. This approach is commonly used by other graphics programs such as desktop publishing systems.

The only disadvantage of this design is that one must recognize that a cross section is made up of multiple files.

Database and Geologic Modelling: PRJ files

The database and geologic modelling functions in VIEWLOG/GIS and VIEWLOG/PRO are organized through the Project File. The Project File contains the common elements of the geologic model, and all primary links to the database. In the Project File, objects, such as 3-D surfaces, can be simultaneously viewed on multiple maps and cross sections.

Gridded Parameter: GRD Files

Cell-by-cell gridded information, created by the geostatistical interpolation functions, is stored in binary files typically using the GRD file extension.

Windows Metafile Images: WMF and EMF files

Central to the operation of VIEWLOG is its ability to generate Microsoft Windows Metafiles (file extension *.wmf or *.emf for Enhanced Metafiles). Metafiles are compact, efficient vector image files, which, unlike MS Windows Bitmaps (*.bmp), can be scaled and reproduced at the highest quality on any Windows supported device (screen, printer, etc.). They can also be copied to the Windows Clipboard and pasted into a variety of Windows applications, including word processors such as Microsoft Word.

Metafiles provide one means of linking between the Log Analysis and Drawing Editor functions. The Log Editor **File/*Print*** function can be used to generate a metafile, which can then be embedded in a drawing. A cross section can be made up of multiple metafiles (one for each well on the section) embedded in one drawing.

QUICK START FOR GROUND WATER MODELING USERS

VIEWLOG for Groundwater Modeling

VIEWLOG provides an integrated borehole data management and interpretation system with geological modelling capabilities. Project Management in VIEWLOG offers the means to fully integrate the data for effective, interactive and enhanced analyses. Data storage is built on an open, relational database structure that can be fully customized. VIEWLOG can simultaneously access the data, allowing real-time, interactive query setup and display. By tightly coupling a powerful borehole Log Editor with GIS-style mapping and 3-D cross-section tools in the Map Editor, VIEWLOG offers an unrivaled level of visual interpretation control.

VIEWLOG Project Management

Project files: *.PRJ

The database and geologic modelling functions in VIEWLOG are organized through the Project file. The Project file contains the common elements of the geologic model and all primary links to the database. In the Project file, objects such as 3-D surfaces can be simultaneously viewed on multiple maps and cross sections.

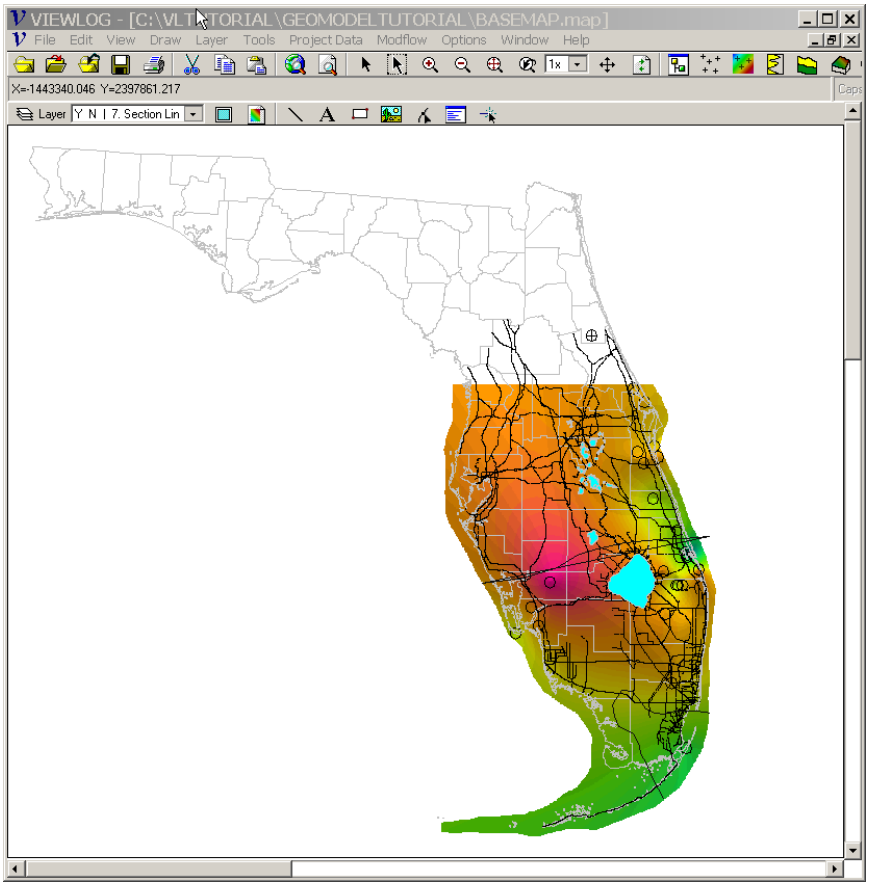
Microsoft Access Database files: *.MDB

Microsoft Access is the most common desktop database that is used with VIEWLOG. Other databases, such as Oracle and SQLServer can also be connected to VIEWLOG. In addition, spreadsheet files (e.g., MS-EXCEL, *.XLS extension) can be connected to VIEWLOG.

VIEWLOG Map Editor

Maps and Cross Section Lines and Text: *.MAP

The integrated Map Editor includes drawing, database and GIS functions optimized for the geosciences. The Map Editor acts as a CAD/GIS drawing system for interpreting and extending borehole data. Interpretation can be performed using simple drawing tools or comprehensive geological modelling tools. The Map Editor supports high-level objects, such as boreholes and 3-D surfaces and includes integrated functions such as kriging. Cross sections can be easily generated along any chosen path through the project area and all section interpretation is performed in 3-D coordinate space. VIEWLOG Map Editor files (plan view and cross section) have the file extension “MAP”.


VIEWLOG - [C:\VLTUTORIAL\GEOMODELTUTORIAL\BASEMAP.map]
File Edit View Draw Layer Tools Project Data Modflow Options Window Help
X=-1443340.046 Y=2397861.217
Layer Y N 7. Section Lin

Sample Basemap.

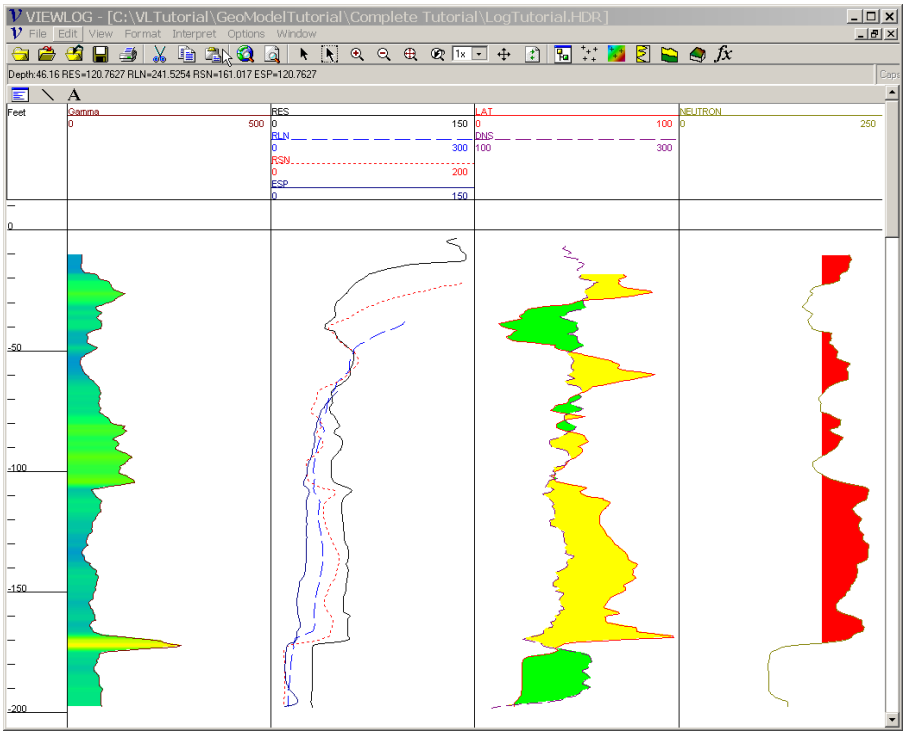
Gridded Interpolation Results: *.GRD

The interpolation of borehole measurements produces a parameter estimate at every grid cell location. This information is stored outside of the database because it is secondary or “derived” from the raw measurements. These files, which contain the *.GRD extension, can be quite large, depending on the number of cells in the grid.

VIEWLOG Log Editor

Well Log Headers: *.HDR

The Log Editor is used to integrate, display and interpret various downhole measurements ranging from geophysical logs, core descriptions, chemical analyses, water levels and core photos. The Log Editor is used to correct, interpret and prepare data for stratigraphic correlation, mapping, and geological modelling. Log data files typically have the file extension *.HDR, which is an abbreviation for “Header”. The HDR files contain information about the well, including a list of all logs from that well.



Example Downhole Geophysical Log.

Introduction to the Map Editor

The integrated Map Editor includes drawing, database and GIS functions that are optimized for the geosciences. In addition to acting as a CAD/GIS drawing system for interpreting and extending borehole data, interpretation can be performed using simple drawing tools or can extend to comprehensive geological modelling. The Map Editor supports boreholes and 3-D surface and has integrated functions such as kriging, and cross sections can be easily generated along any chosen path through the project area, with all section interpretation performed in 3-D coordinate space. VIEWLOG Map Editor files (plan view and cross section) have the file extension “MAP”.

Editing Drawings

Once a drawing is created or opened from file, it can be edited. Polylines can be drawn, text can be added, images can be linked, and files (for example .map, .shp, or .dxf) can be imported or linked. It is common to have roads, streams, railroads and political boundaries as shape files (*.shp), which can be linked into the drawing.

The Viewport

A viewport is used to display a portion of the World coordinate system within a page. The page viewport can be thought of as a window to the world. Two parts of the viewport are defined: one in World and one in Page coordinates. The World viewport defines the portion of the map or section that will be displayed. The Page viewport defines the position where the map or cross

section will appear on the page. All objects in World coordinates outside of the world viewport are hidden in Page View (the World viewport can be used to clip the map).

Map Views

Map Views allow the user to return to the exact settings of a specific map, either cross section or plan view. Creating a map view of that drawing will store the map settings exactly as they are. Double-clicking on the created map view in the map view menu will restore the settings to that of the created map view. There is no limit to the number of map views that can be created.

Map Text Fields and Automatic Titles and Legends

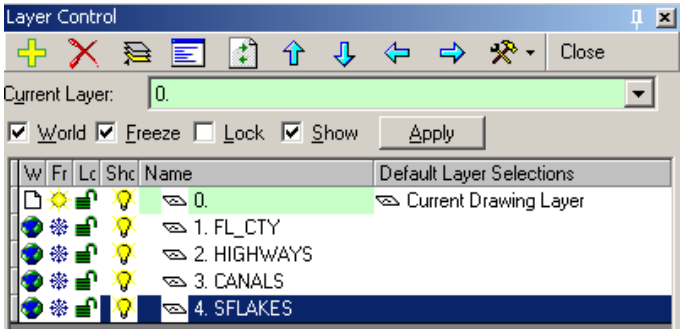
VIEWLOG map text objects can contain keywords that invoke powerful internal variables and advanced display properties. These include, for example, keywords that automatically generate a map legend that dynamically adjusts depending on what map features are visible.

Map Text Fields are keywords, enclosed in square brackets and inserted in a text object. VIEWLOG has a number of text fields built into the Text Attributes window (to access this window, use **Edit/*Text Attributes*** once you have selected an existing Text object, or, with new text, use the **Draw/*Text***, and click the left mouse button in the area you want text to appear – this will open the Text Attributes window for the new text). Regular text can be combined with the Insert Fields.

> **Note:** For more information on VIEWLOG and Advanced Mapping and GIS capabilities please refer the VIEWLOG Main Help menu.

Drawing Layer Management

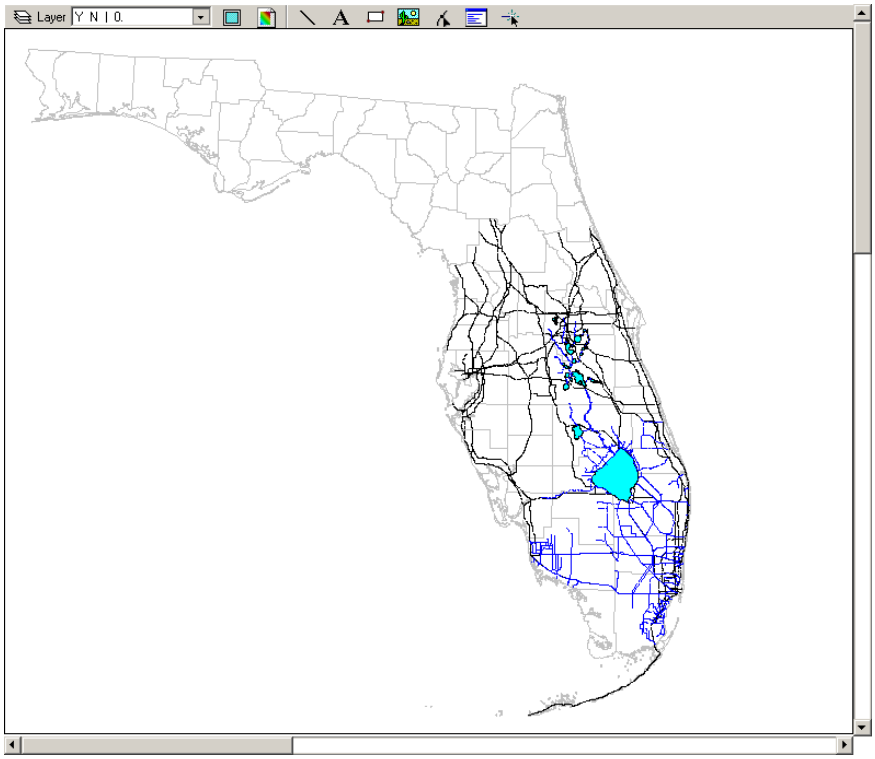
VIEWLOG has a layer menu that functions in a similar way to an AutoCAD layer menu. Layers can be frozen or unfrozen, visible or invisible, locked, unlocked, used in World or Page coordinates. Viewlog will allow the user to select and work with objects as an individual layer or as groups of layers. The user cab also use the arrange functions to control drawing order of objects within a layer. For more information on Layer management please refer to the ***Geological Modelling Tutorial:*** Lesson 2: Mapping and GIS Functions.



The Layer Menu.

Linking to Shape Files

Some projects include many large shape files, which can result in very large VIEWLOG map files that can take considerable time to load and save. To avoid this problem, VIEWLOG also allows the user to link to shape files (or VIEWLOG MAP files), so the contents of the file can be displayed in the Map Editor, but the actual contents of the file are not loaded into the current VIEWLOG map. This is known as linking to a shape file. For more information on linking shape files please refer to the ***Geological Modelling Tutorial:*** Lesson 2: Mapping and GIS Functions.



Example Base Map with Shape Files.

Introduction to VIEWLOG Projects

VIEWLOG is designed so that only one copy of each field measurement is stored in the database. Centralized storage offers numerous benefits, including improved error tracking, reduced data volume, and simplified data backup.

While the database provides centralized storage of field data, a corresponding system was required to manage the information on multiple maps and cross-sections that make up the interpretation of the data. VIEWLOG Project files provide the key linkage between the database, the geologic interpretation, and the numerous maps and cross-sections. Most important, Project file objects link the following:

- Raw data stored in the database
- Display appearance for plan, section and 3-D views
- Interpretation and interpolation results, and

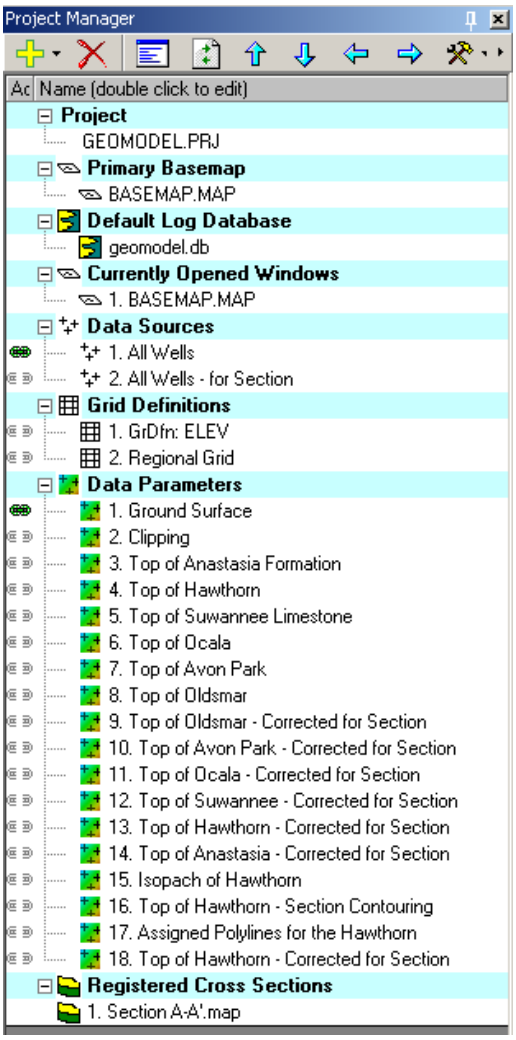
- Processing and analysis functions

Setting up a Project

Creating a Project file will allow links with the database and common elements of the geologic model to be stored. Objects in the Project file can be viewed in multiple maps and cross sections at the same time. While multiple maps can be open at the same time, only one project can be open in VIEWLOG at one time.

Registering a Base Map

Registering a map links the map to the Project file. This can be done in the Project Manager.


Project Manager
Ac
Name (double click to edit)
Project
GEOMODEL.PRJ
Primary Basemap
BASEMAP.MAP
Default Log Database
geomodel.db
Currently Opened Windows
1. BASEMAP.MAP
Data Sources
1. All Wells
2. All Wells - for Section
Grid Definitions
1. GrDfn: ELEV
2. Regional Grid
Data Parameters
1. Ground Surface
2. Clipping
3. Top of Anastasia Formation
4. Top of Hawthorn
5. Top of Suwannee Limestone
6. Top of Ocala
7. Top of Avon Park
8. Top of Oldsmar
9. Top of Oldsmar - Corrected for Section
10. Top of Avon Park - Corrected for Section
11. Top of Ocala - Corrected for Section
12. Top of Suwannee - Corrected for Section
13. Top of Hawthorn - Corrected for Section
14. Top of Anastasia - Corrected for Section
15. Isopach of Hawthorn
16. Top of Hawthorn - Section Contouring
17. Assigned Polylines for the Hawthorn
18. Top of Hawthorn - Corrected for Section
Registered Cross Sections
1. Section A-A'.map

The Project Manager.

Note: A Project file can be linked to multiple map and cross section files. Updating a Project file will automatically update all linked maps and cross sections.

Introduction to Data Sources

Data Sources contain information about a group or class of boreholes or monitoring intervals and provide a logical structure for organizing, displaying and processing these data. Groups can be defined on any basis and use a database table or query for selection. Data Sources bring together the database link, display options, geologic display and editing and some grid-based processing functions.

While Data Sources are frequently used to define a group of boreholes that fall in one geologic formation, they are generally not used to classify measurements made in that formation. Data Parameters, which are outlined in the ***Geological Modeling Tutorial:*** Lesson 6: Working with Data Parameters are used for that option.

The Data Source structure is very flexible, and because it contains a link to a database, as new boreholes are added to the database, they will automatically be added to the Data Source if they meet the conditions defined in the Data Source table or query. For more information on Data Sources, please refer to the ***Geological Modeling Tutorial:*** Lesson 5: Working with Data Sources.

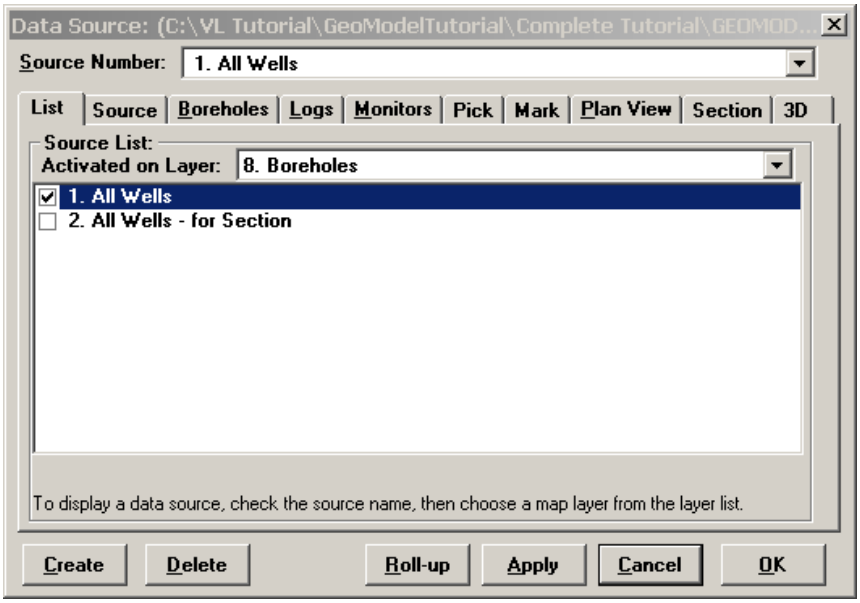
Data Sources are used for:

- Borehole Location Management and Posting
- Grouping of Monitoring Information
- Linkage to HDR file for Geologic Information
- Database Linkage for on-section geologic unit picking
- Writing gridded (interpolated) information back to fields in the database

> **Note:** Before a Data Source can be created, it is necessary to link the map to a Project file. This allows the database links that will be created in the Data Source to be saved in the Project file.

Creating a Data Source

Each time you create a new Data Source, you must fill in the appropriate information. Following the ten tabs in order in the Data Source menu will ensure that the user remembers to fill in the appropriate information.



Creating a Data Source.

The Data Source Menu

The Data Source menu consists of ten tabs that control the properties and display of a Data Source. Six are described below; the remaining four will be discussed in another section.

The **List** tab displays the existing Data Sources and allows the user to check them on and off.

The **Source** tab defines the name of the Data Source and the basic database connection parameters.

The database table and fields are selected in the **Boreholes** tab. To view borehole locations in plan view, the name, ID, and location fields should all be linked to database fields. For viewing boreholes in cross section, the elevation field must also be linked. All other fields are optional.

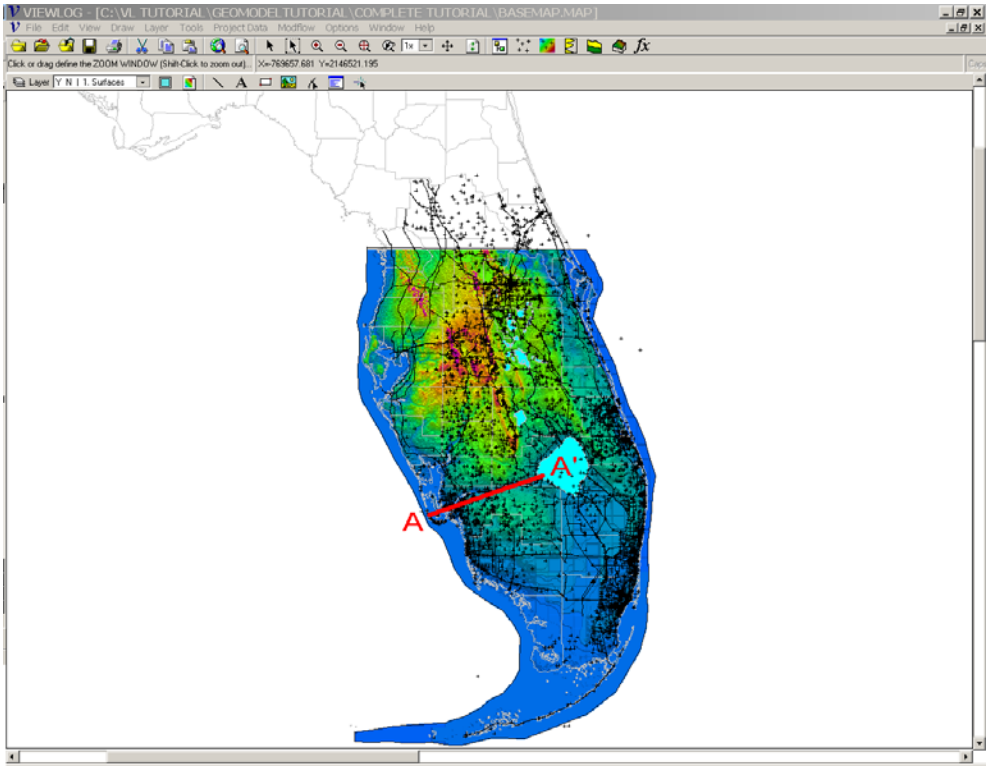
The **Logs** tab contains a HDR file field that is used to link a VIEWLOG HDR file to the borehole, and a default HDR file can be defined for all wells in this source. The **Logs** tab allows the user to specify two different HDR files. The first is used to present borehole logs on cross section and the second is used to show borehole logs in preview mode. If the second HDR file is left blank, logs will be shown in preview mode using the default Template HDR.

In the Data Source window, the **Plan View** tab is used for formatting and display of the borehole information on plan-view maps.

The **Section** tab controls the display of the well information on cross sections.

Displaying Boreholes on the Map

Once the above tabs have been completed, the borehole information is ready to be displayed on a map. It is possible to filter out boreholes based on criteria entered into the filter section of the boreholes tab. For use of the filter, please see the ***Geological Modelling Tutorial:*** Lesson 5: Working with Data Sources.



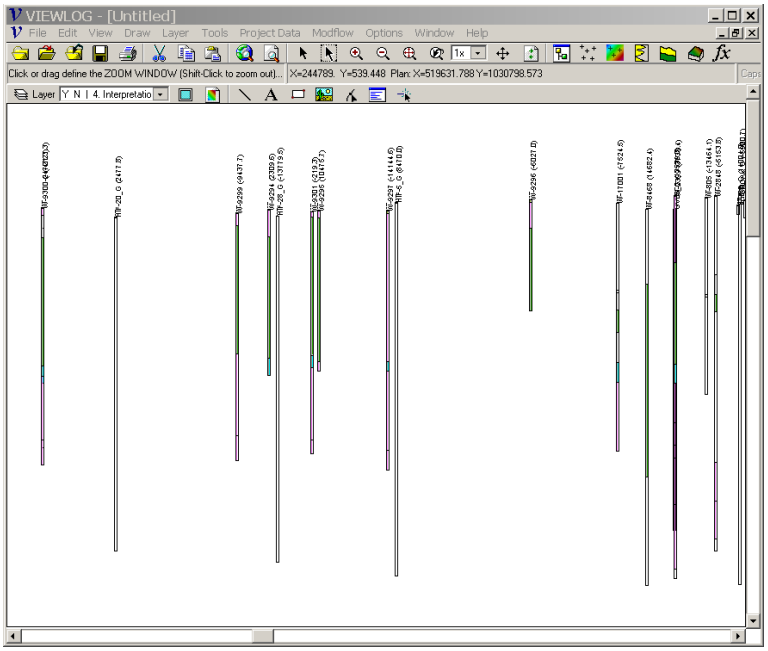
Displaying Boreholes on a Map.

Selecting and Editing Borehole Details

The borehole information, including ALL fields in the Data Source query or table, can be displayed within VIEWLOG as a floating table window. Because all fields in the table or query are available, the user can add easily add related fields for editing. Editing changes are immediately written back to the database.

Cross Section with Boreholes

Creating cross sections is an integral part of any Geological Model. Boreholes can be displayed in cross-section, and display properties are controlled by the **Section** tab. Headers for the display of borehole log information are selected in the **Logs** tab.


VIEWLOG - [Untitled]
File Edit View Draw Layer Tools Project Data Modflow Options Window Help
Click or drag define the ZOOM WINDOW (Shift-Click to zoom out)...
X=244789. Y=539.448 Plan: X=519631.788 Y=1030798.573
Layer Y N 4. Interpretatio

Example Cross Section with Boreholes.

By drawing a polyline on a plan-view map and selecting the cross-section icon, a cross-section will be created. Simply specify the offset distance, and all boreholes within that distance will be projected onto the section. Once the section is generated, additional interpretation can be performed using all of the drawing functions listed above.

Data Source Browser

The Data Source Browser, located in the **Tools** menu, provides a preview of a selected borehole using a header template specified in the Data Source. For more information please see the ***Geological Modelling Tutorial:*** Lesson 5: Working with Data Sources.

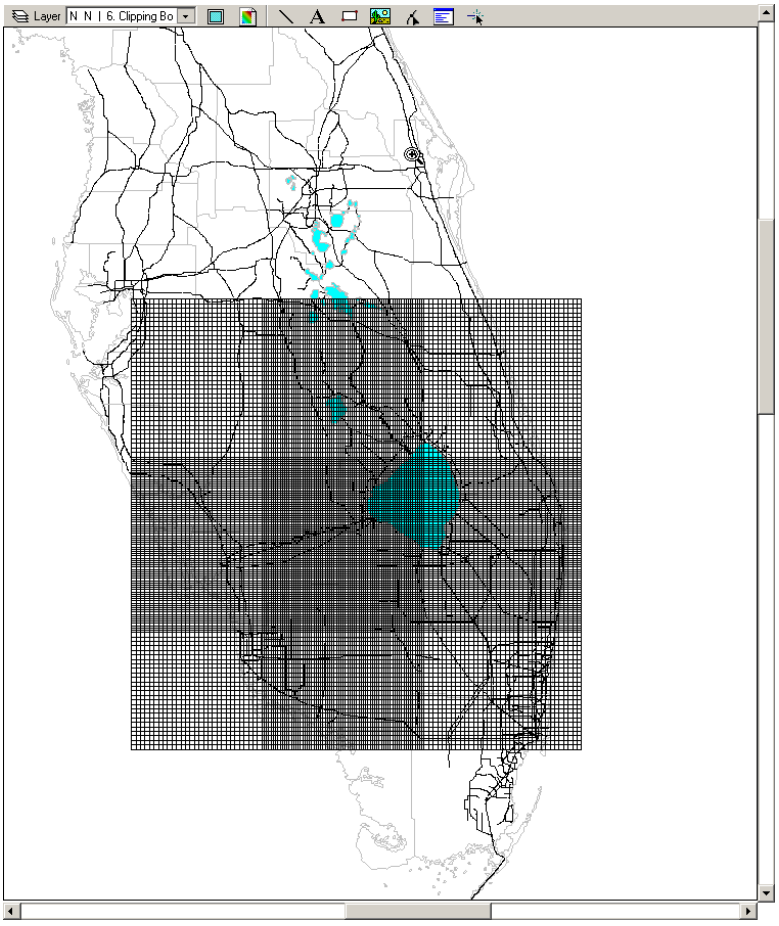
Introduction to VIEWLOG Grids

VIEWLOG grids are used for the interpolation process. Interpolation consists of two elements: a grid definition, and a file that contains the interpolated results at each grid cell. In the Drawing Editor, the **Grid** menu is used to define one or more grid definitions. A grid definition includes information about the position and number of rows and columns in a grid. The interpolation process is controlled through the Data Parameter menu.

Creating and Displaying Grid Definitions

In general, it is good idea to carefully define (and refine) your grid definitions early in the project. Major changes to a grid later in a project may require that each parameter be re-interpolated to a revised grid definition. Re-interpolation is not a difficult task, but can take a lot of processing time.

Before a Grid Definition can be defined, it is necessary that the user has previously set up a map with project links and a Data Source. After creating a new grid, assign a descriptive name to the grid.



Example of a Grid Definition.

There is no limit to the number of grids that can be created. Different grids can be used for different study areas in a large region. Alternatively, one grid can be used, and cell sizes adjusted or “refined” in areas of interest. New grids are initially created with uniform cell sizes, depending on the number of rows and columns in the grid and the X and Y extents of the grid.

Moving a Grid

Moving a grid is accomplished by redefining the X and Y origin in the Grid Definition window. The grid refinement, and all settings, will be preserved.

Editing and Refining a Grid

By default, grid definitions have uniform cell sizes. The ability to refine a grid is a very powerful feature, as it allows smaller cell sizes in areas of interest (e.g., near pumping wells). For example, a grid with large cells could be defined to cover the entire study area, and then cell size can be refined in zones where there are many boreholes. This provides detail only in zones of interest, and provides a seamless transition from the local to the regional scale.

Introduction to Data Parameters

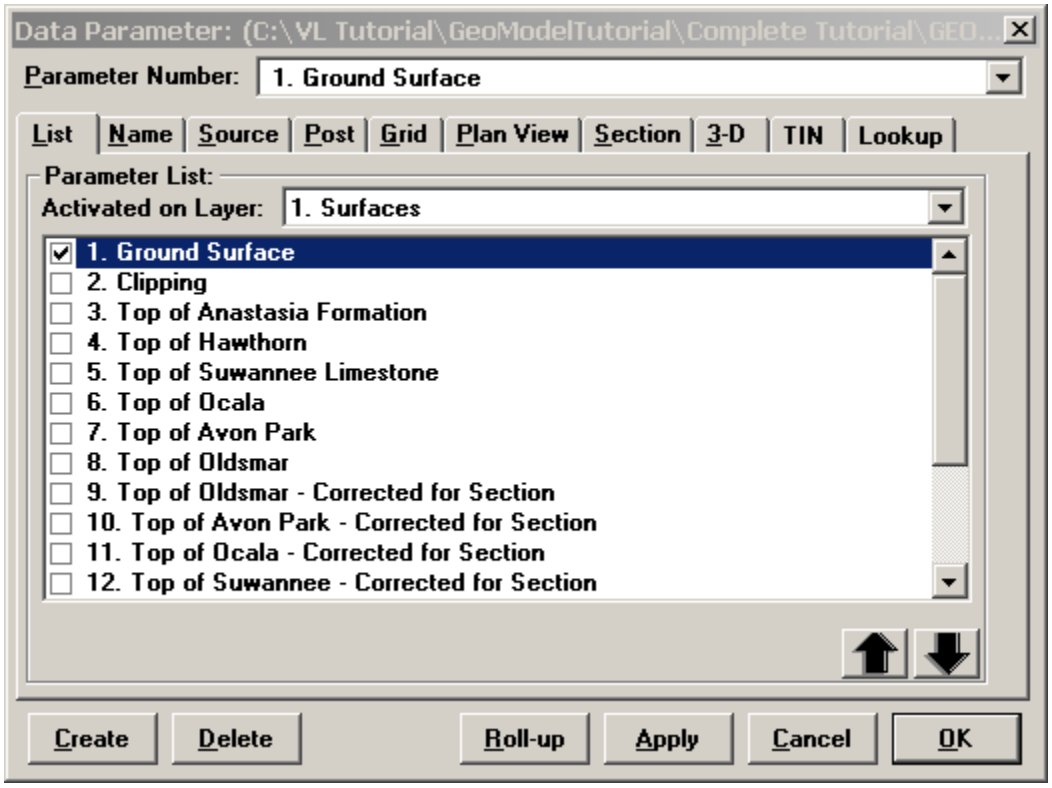
Data Parameters are used to manage any mappable field measurement. Examples include geologic surfaces, water level snapshots, and rock properties. The Data Parameter menu brings together a database link, gridding and interpolation details, and plan-view, section and 3-D display options.

Creating a New Data Parameter

Data Parameters are typically created by linking to the database holding the information for that parameter. The Data Parameter menu has ten tabs that control the interpolation and display of the Data Parameter. Seven of the ten tabs are described below.

The **List** tab contains a list of the available Data Parameters. Each Data Parameter can be activated by placing a check in the appropriate check box.

The **Name** tab allows the user to specify a name for the Data Parameter and record any additional notes about the parameter.



Data Parameter Menu.

The **Source** tab links the Data Parameter to a Data Source to be interpolated. If this tab is left blank, data is selected in the **Grid** tab.

The **Post** tab will show in plan view the locations of the data points to be interpolated.

The **Grid** tab performs the interpolation and outputs the *.grd file with the completed interpolation.

The **Plan View** tab controls the display of the interpolated data. Contours are set here.

The **Section** tab controls the display of the interpolated data in cross section view. This includes colour shading between two surfaces, called surface pairing.

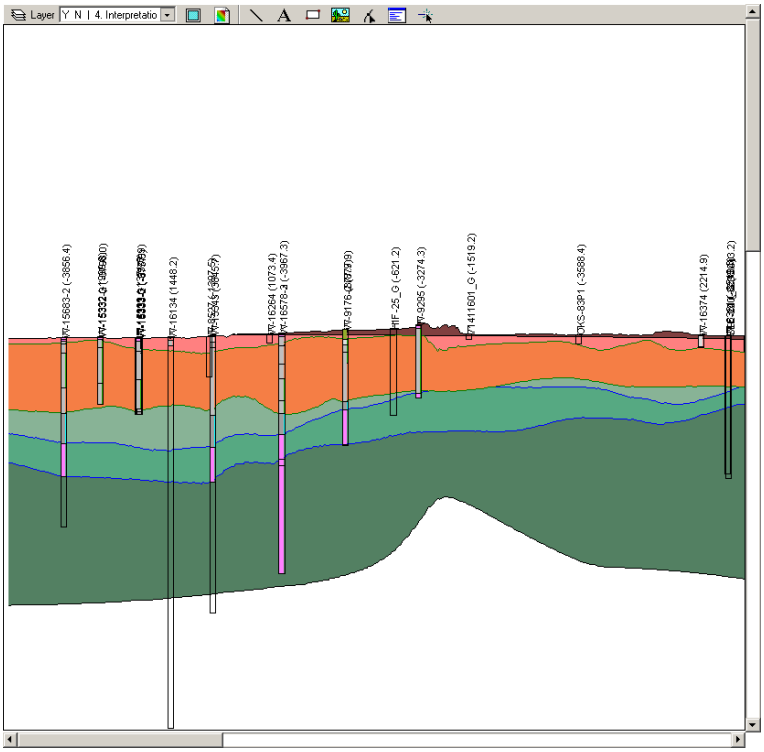
Clipping Gridded Data

Another useful feature is the use of a closed polygon to clip the data. This allows the user to show only gridded data within a desired area, and is done by creating a new Data Parameter on the same grid. In this new parameter, each cell is assigned either a 1 or a 0; areas assigned to 0 will not be shown.

For more detail on clipping gridded data, please see the ***Geologic Modelling Tutorial:*** Lesson 6: Working with Data Parameters.

Creating Cross Sections

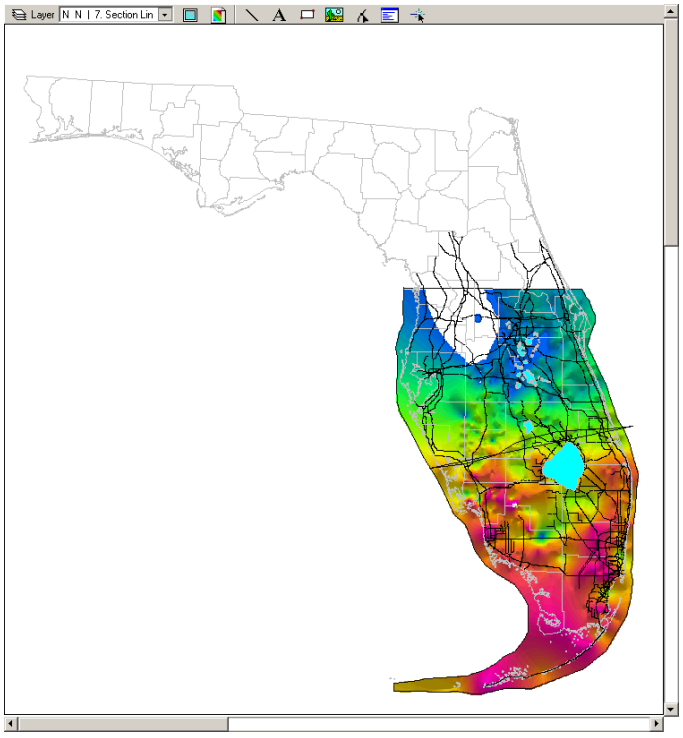
VIEWLOG was specifically designed for the creation and manipulation of geological cross Sections. While 3-D visualization (through the VIEWLOG 3D Geo-Explorer) is visually powerful, cross sections allow more precise interaction with the geological model.
Creating cross sections is very easy, and the cross section editor is fully integrated into the map and log editing system. Simply draw or select any polyline on the plan-view map to instantly create a section along that line. Complex, multi-segment polylines can be used. All geological layers in the project are “sliced” and projected onto the cross section. Also, because all boreholes and projected surfaces are drawn from the geologic model project file, cross sections update automatically when a geologic surface or unit is modified.



Cross Section Example.

Parameter Calculator

The Parameter Calculator allows the user to relate one surface to another using mathematical functions. For example, if the bedrock surface is subtracted from the ground surface, it would create a parameter that contains the thickness of a unit. This is referred to as an isopach map, and in this example refers to thickness of overburden.



Example Isopach Map.

The Parameter Calculator can perform calculations on any existing parameter. The output of the Parameter Calculator is a new parameter that is displayed through the Data Parameter menu. For more information on the Parameter Calculator please refer to the ***Geological Modeling Tutorial:*** Lesson 6: Working with Data Parameters.

Introduction to Advance Mapping Options

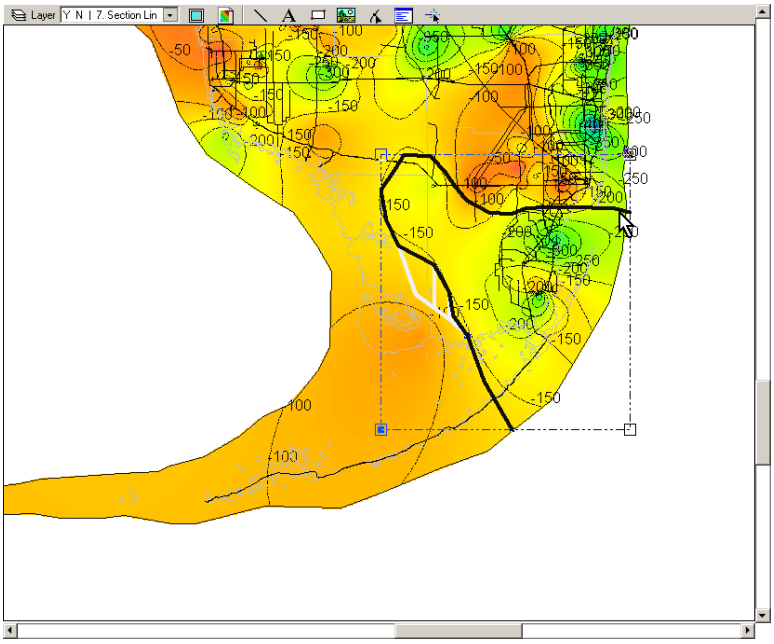
Section Picking

Periodically, when creating cross sections, the picks for the tops of Formations are either incorrect or non-existent. VIEWLOG provides the ability to hand pick these points and write them back to the database. For more information on Section Picking, please refer to the ***Geological Modeling Tutorial:*** Lesson 8: Advanced Mapping Options.

Hand Contouring on Section and on Plan View

There are two methods available for hand contouring data, either in section view or in plan view. In some instances, after generating surfaces for the tops of formations or aquifers, the user may

wish to make minor adjustments to the morphology of that surface, particularly in areas where there are no boreholes. An extreme example would be a buried valley. For more information on Hand Contouring, please refer to the ***Geological Modeling Tutorial:*** Lesson 8: Advanced Mapping Options.



Example of Hand Contouring in Plan View.

Introduction to Geologic Database Management

The database connectivity functions in VIEWLOG provide powerful tools for interacting with information stored in an open database structure. The Downhole Geophysics Tutorial provides an introduction to databases for VIEWLOG users.

Creating a Query in MS-Access

Because borehole locations and borehole depths may be stored in different tables, a basic database query that combines fields from these tables should be created. Common data stored in geologic databases includes Borehole ID numbers, Borehole Names, Eastings, Northings, Top Elevations (ground surface or reference point), bottom hole elevations, top and bottom of monitors, and well construction details.

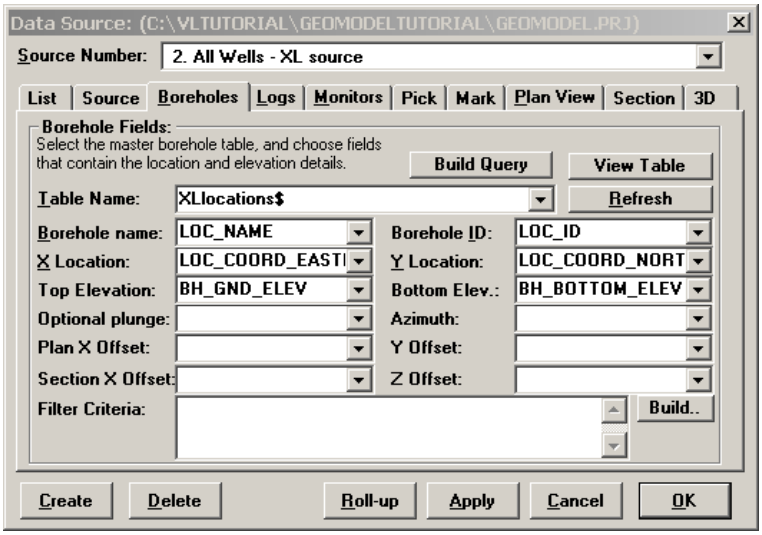
A standard query for displaying boreholes in the VIEWLOG Map Editor combines the following fields: Borehole ID, Borehole Name, Easting, Northing, Top Elevation, Bottom Elevation. While strict order of fields in the query is not required, it is useful to keep the fields in the order as stated above. When the query is selected through the Map Editor for display, the fields will be automatically loaded into the correct locations.

Filtering a Query in MS-Access

Filtering queries provides the user with greater control over the data in the database. Within the query, boreholes can be selected according to any of the fields selected. As an example, the user can exclude boreholes that do not have top or bottom elevations.

Using MS-EXCEL for Data Sources and Parameters

VIEWLOG is also capable of connecting to geologic data that is in a spreadsheet, such as MS-Excel. Data Sources and Data Parameters can be directly linked to the MS EXCEL spread sheets, in much the same manner as MS ACCESS. In the example below the spreadsheet is defined by choosing it in the **Table Name** field.



Example of linking to MS-Excel.

Introduction to the Log Editor

Editing and analyzing geophysical logs is completed in the VIEWLOG Log Editor. The Log Editor allows the user to edit and add text interpretation to individual or suites of geophysical logs, and to correct and interpret data from logged wells, including adjusting the data presentation, correcting the logs, adding interpretation, and outputting the results. In addition, multiwell interpretation, physical property analysis and geological modeling can be performed in the Log Editor.

Editing a Geophysical Log

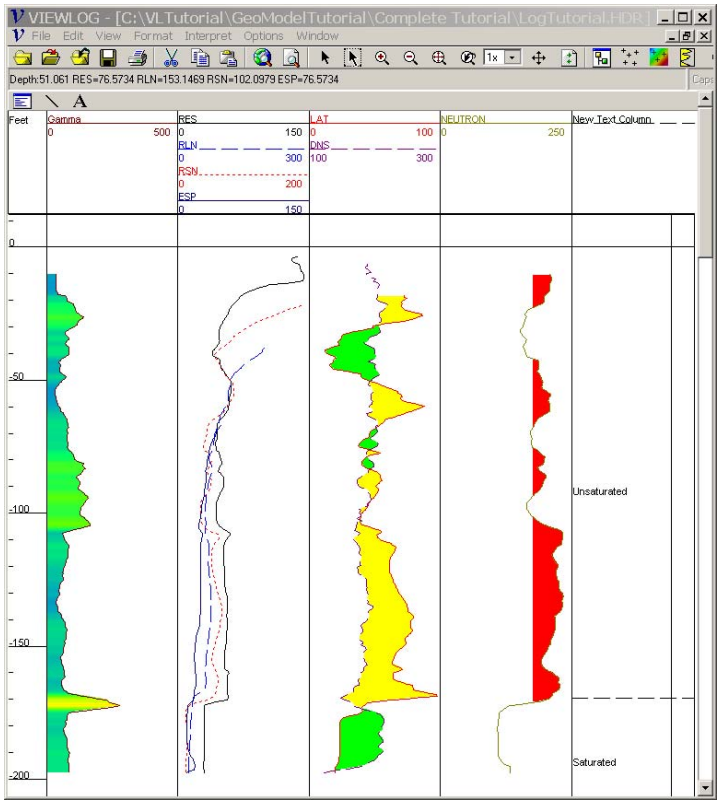
Once a geophysical log is opened in the log editor, the log can be manipulated in many ways. Some options include the following: changing the thickness of data displayed; zooming in and out; changing the log scales; changing the order of tracks displayed; changing the colour of logs displayed; filling the logs with colour. For more information please refer to the ***Geological Modelling Tutorial:*** Lesson 11: Correcting Log Data.

Analyzing Downhole Data

An important part of analyzing downhole data is to ensure the proper calibration and log corrections have been made to the data. VIEWLOG encompasses powerful log editing features including functions for stretching, smoothing, trimming, re-sampling, averaging and linking logs. Data can be edited point by point, if necessary. For more information please refer to the ***Geological Modelling Tutorial:*** Lesson 11: Correcting Log Data.

Adding Interpretation

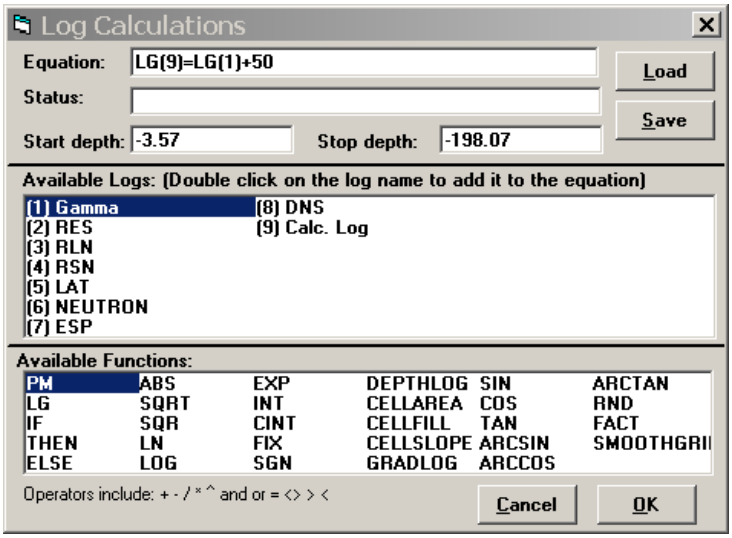
Adding interpretation to the log data is also crucial to analyzing geophysical logs. VIEWLOG provides functions for defining contacts and adding lithologic descriptions to the logs. When the file is saved, all descriptions are stored in the header file for later reference. Key words entered in the text descriptions can be used to create a lithology symbol column.



Example Geophysical Log.

Performing Log Calculations

Log calculations can be user defined by generating processing equations to generate new or corrected logs. The Log calculation function has support for a wide variety of mathematical functions (sin, cos, tan, abs etc.), including conditional statements (if then and else) and logical operators (and, or, not). Equations can even be applied to a limited depth interval to correct only portions of the log



Example of the Log Calculator.

Log Output

Logs can be output into several different formats, including hard copy, jpg, pdf, and the Viewlog map format. When printing logs, VIEWLOG utilizes the current log scaling parameters as the default format. This simplifies output, as setting up the screen to display the logs, depth and scaling parameters is equivalent to setting the output format.

Saving Changes

During your log file editing session, it is important to note that any changes and interpretations are made only to data retained in the computer's memory. No changes will be saved until the program is directed to do so, allowing changes to be abandoned by exiting without saving the file. When log-editing changes are saved, all related parameters are written to disk, including editing changes, interpretation, and the configuration of the log display.

Introduction to Log Database Connectivity

Why Connect the Log Editor to the Database?

When both the data and related display parameters are stored in the HDR file structure, this is referred to as "stand alone" file management. Unfortunately, this it is not ideal for dealing with large numbers of wells. For those situations, database connectivity becomes essential.

To address this issue, the Log Editor can be connected directly to a database where no data is stored in the HDR file, and the HDR parameters are used, instead, as a template for formatting the borehole information as it is extracted from the database. Each log or interpretation column is linked to the database table or query, so that when the HDR file is opened VIEWLOG automatically extracts the required well data from the database.

The key to interpreting multi-parameter borehole data is data integration. It is truly a multivariate data set with varying correlations between physical parameters for different lithological units. Spreadsheets and most graphical display packages are primarily 2-dimensional, whereas

geophysical borehole data is 4-dimensional (x, y, z position and physical parameter). To achieve easy access to data in a multi-well, multi-parameter setting requires construction of a relational database. In this type of setting it becomes relatively simple to test hypotheses on the basis of physical property, depth, location, or any combination of parameters. For more information please refer to the ***Geological Modelling Tutorial:*** Lesson 11– Correcting Log Data.

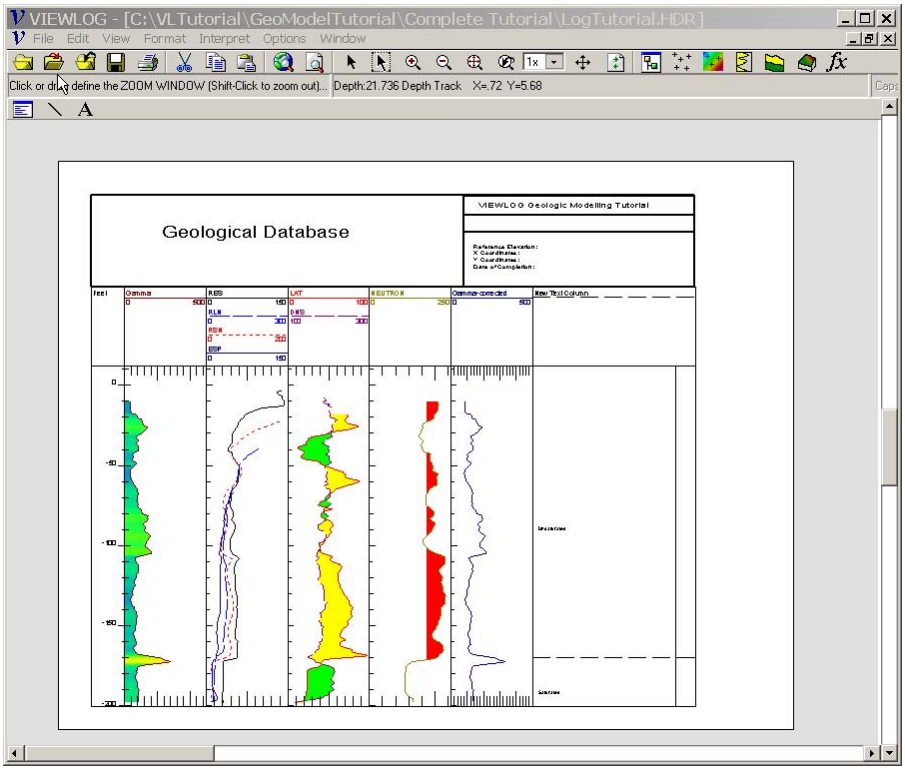
DB Configuration Files

The first step in connecting to a log database is creating a DB configuration file. By creating a DB configuration file, VIEWLOG will remember all the settings, linking the tables and queries in the user-defined manner.

When opening a log database in the VIEWLOG Log Editor, the menu provides several options to link to specific fields in the selected database. For example, data fields pertaining to Logs can be selected appropriately, as well as fields pertaining to Interpretation.

Creating Template HDR Files

It is very important to set up Log Templates, either for cross section or Log presentations. When using the Log Editor with a database, the first task is to select a well for use in setting up the display template settings. Typically, it is best to choose a well with detailed information. By selecting a representative well, it is easier to format and configure the log display.


VIEWLOG - [C:\VLTutorial\GeoModelTutorial\Complete Tutorial\LogTutorial.HDR]
File Edit View Format Interpret Options Window
Depth:21.736 Depth Track X=.72 Y=5.68
Geological Database

Example Template HDR.

Once the well is selected, a new HDR file is created. The unique well name or ID number is then entered in the Wellname Field in the Log Editor. This is critical because VIEWLOG will use this

value to extract information from the database. For more information please refer to Geological Modelling Tutorial: Lesson 11 – Correcting Log Data

Creating and Linking a Header Template for Logs

Creating automated header templates for log reports is accomplished in the map editor. The header templates are then saved as a *.map file and “attached” to the log template (in the log editor) through Format/Page/Global setting/header image menu item. Selecting the header template in the file option and clicking the inline image button, will insure that the header template is always on top of the log tracks. For more information please refer to the ***Geological Modelling Tutorial:*** Lesson 11– Correcting Log Data.

QUICK START FOR DOWNHOLE GEOPHYSICAL USERS

VIEWLOG for Downhole Geophysics

VIEWLOG provides a truly integrated borehole data management and interpretation system and geological modelling. VIEWLOG Project Management offers the means to fully integrate the data for an effective, interactive and enhanced analysis. VIEWLOG data storage is built on an open, relational database structure, which can be fully customized by the end user. VIEWLOG can simultaneously access the data, allowing real-time interactive query setup and display. By tightly coupling a powerful borehole Log Editor with GIS-style mapping and 3-D cross-section tools, VIEWLOG offers an unrivaled level of visual interpretation control.

VIEWLOG Project Management

Project files: *.PRJ

The database and geologic modelling functions in VIEWLOG are organized through the Project file. The Project file contains the common elements of the geologic model and all primary links to the database. In the Project file, objects such as 3-D surfaces can be simultaneously viewed on multiple maps and cross sections.

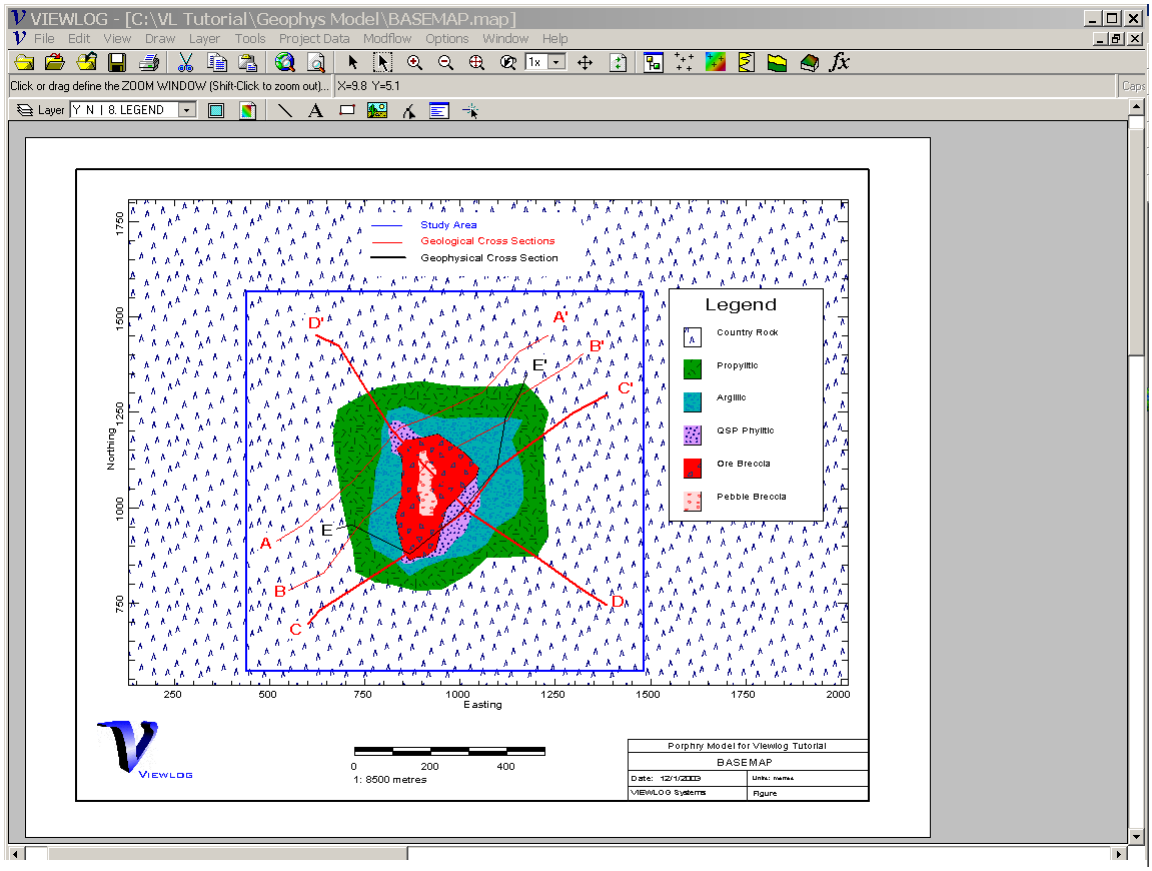
Microsoft Access Database: *.MDB

Microsoft Access is the most commonly used desktop database with VIEWLOG. Other databases, such as Oracle and SQLServer can also be connected to VIEWLOG. In addition, spreadsheet files (e.g., MS-EXCEL, *.XLS extension) can be connected to VIEWLOG.

VIEWLOG Map Editor

Maps and Cross Section Lines and Text: *.MAP

The integrated Map Editor includes drawing, database and GIS functions optimized for the geosciences. The Map Editor acts as a CAD/GIS drawing system for interpreting and extending borehole data. Interpretation can be performed using simple drawing tools or can extend to comprehensive geological modelling. The Map Editor supports high-level objects, such as boreholes and 3-D surface and has integrated functions such as kriging. Cross sections can be easily generated along any chosen path through the project area and all section interpretation is performed in 3-D coordinate space. VIEWLOG Map Editor files (plan view and cross section) have the file extension “MAP”.



Example Basemap.

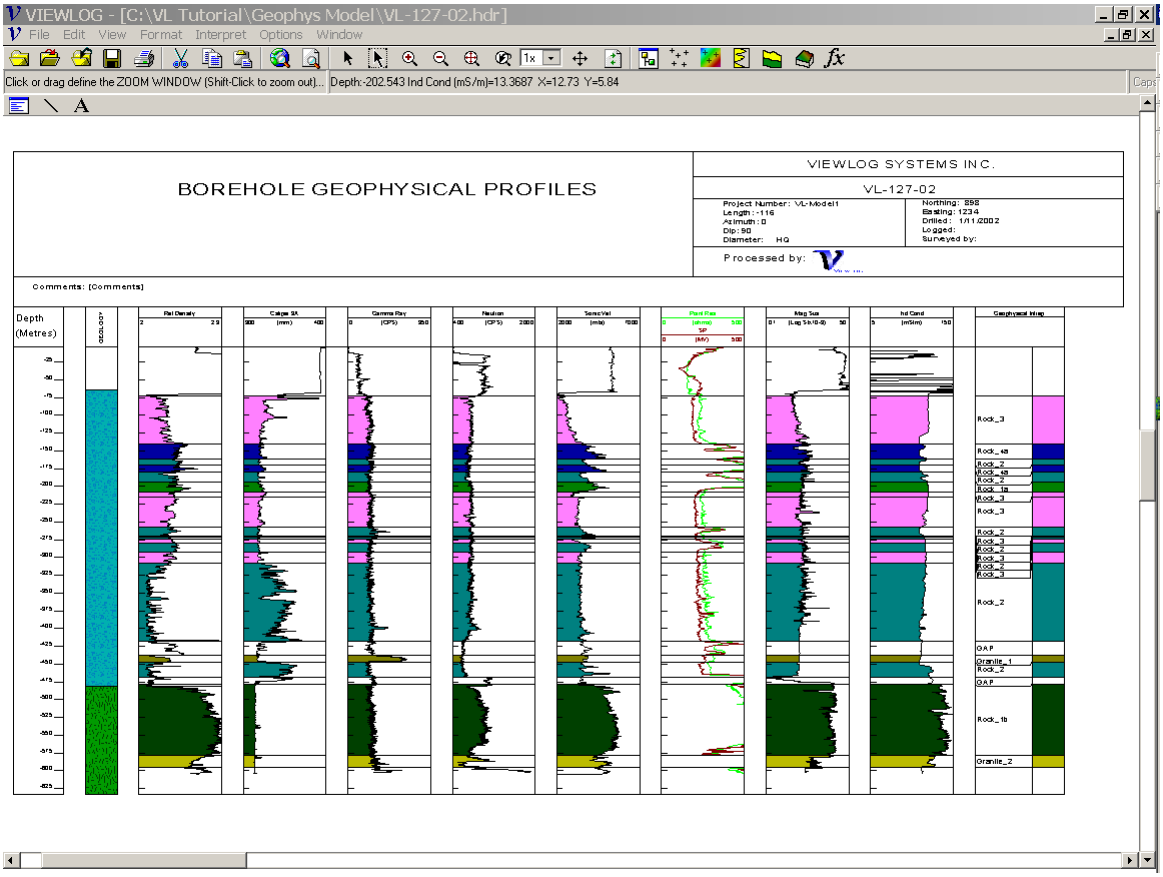
Gridded Interpolation Results: *.GRD

The interpolation of borehole measurements produces a parameter estimate at every grid cell location. This information is stored outside of the database, because it is secondary or “derived” from the raw measurements. These files can be quite large, depending on the number of cells in the grid.

VIEWLOG Log Editor

Well Log Headers: *.HDR

The Log Editor is used to integrate, display and interpret various downhole measurements ranging from geophysical logs, core descriptions, chemical analysis, water levels and core photos. The Log Editor is used to correct, interpret and prepare data for stratigraphic correlation, mapping, and geological modelling. Log data files typically have the file extension “HDR”, which is an abbreviation for “Header”. The HDR files contain information about the well, including a list of all logs from that well.


VIEWLOG - [C:\VL Tutorial\Geophys Model\VL-127-02.hdr]
File Edit View Format Interpret Options Window
Click or drag define the ZOOM WINDOW (Shift-Click to zoom out)...
Depth:-202.543 Ind Cond (mS/m)=13.3687 X=12.73 Y=5.84
BOREHOLE GEOPHYSICAL PROFILES
VIEWLOG SYSTEMS INC.
VL-127-02
Comments: (Comments)
Depth (Metres)

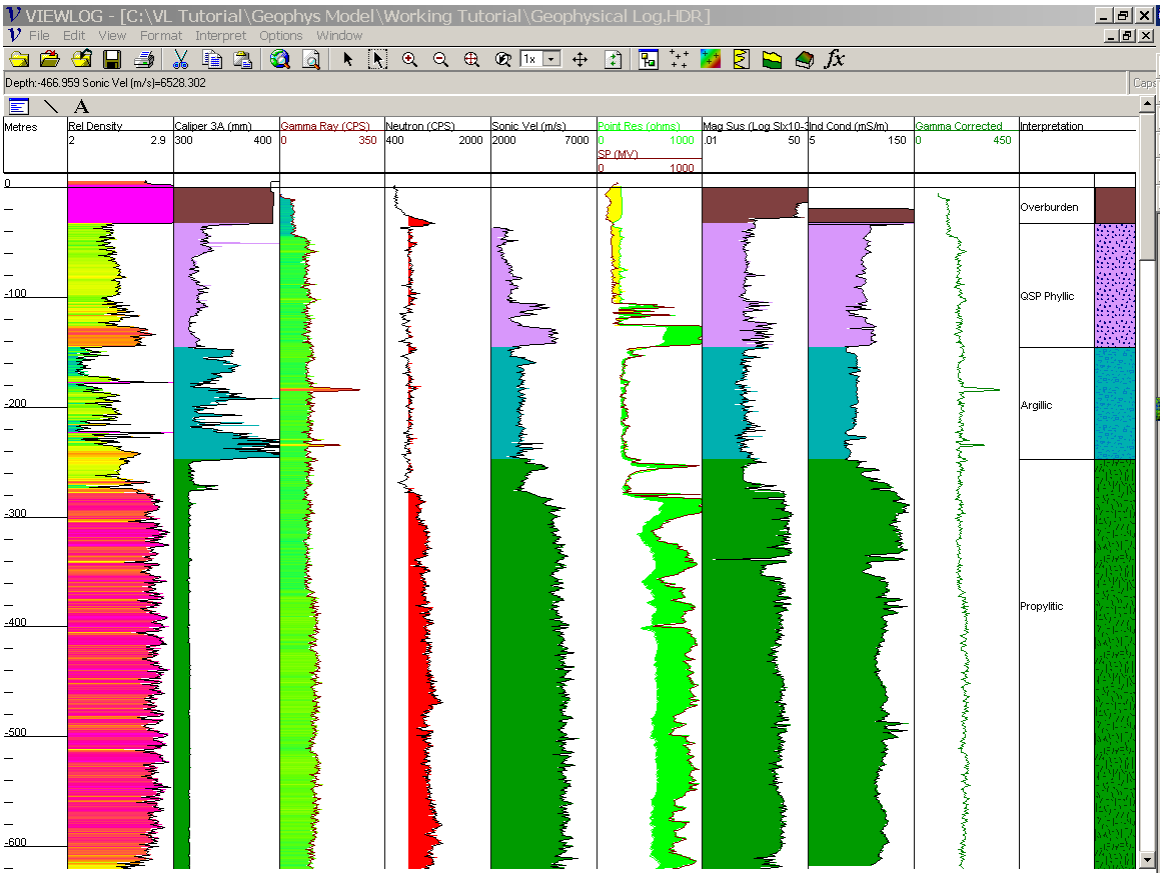
Example Geophysical Log.

Downhole Geophysical Tutorial

Users interested in a detailed geophysics introduction should complete the Viewlog Downhole Geophysics Tutorial. The tutorial contains the basic files needed to complete several Viewlog lessons, plus the completed VIEWLOG tutorial project for reference purposes. The tutorial goes through everything mentioned in the Quick Start Guide in greater detail, and gives step-by-step instruction on how to perform the functions mentioned.

Introduction to the Log Editor

Editing and analyzing geophysical logs is completed in the VIEWLOG Log Editor. The Log Editor allows the user to edit and add text interpretation to individual or suites of geophysical logs, and to correct and interpret data from logged wells, including adjusting the data presentation, correcting the logs, adding interpretation, and outputting the results. In addition, multiwell interpretation, physical property analysis and geological modeling can be performed in the Log Editor.



Example Geophysical Log.

Editing a Geophysical Log

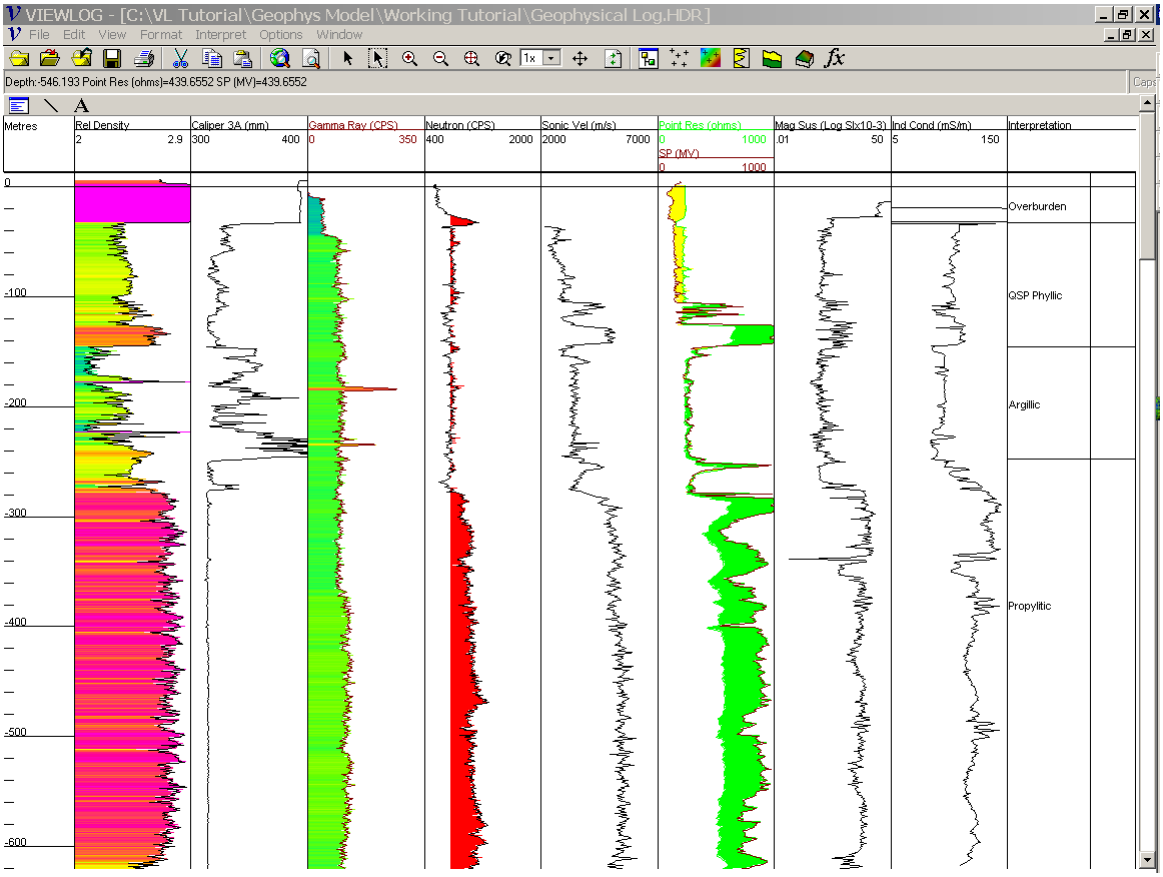
Once a geophysical log is opened in the log editor, the log can be manipulated in many ways. Some options include the following: changing the thickness of data displayed; zooming in and out; changing the log scales; changing the order of tracks displayed; changing the colour of logs displayed; filling the logs with colour.

Analyzing Downhole Data

An important part of analyzing downhole data is to ensure the proper calibration and log corrections have been made to the data. VIEWLOG encompasses powerful log editing features including functions for stretching, smoothing, trimming, re-sampling, averaging and linking logs. Data can be edited point by point, if necessary.

Adding Interpretation

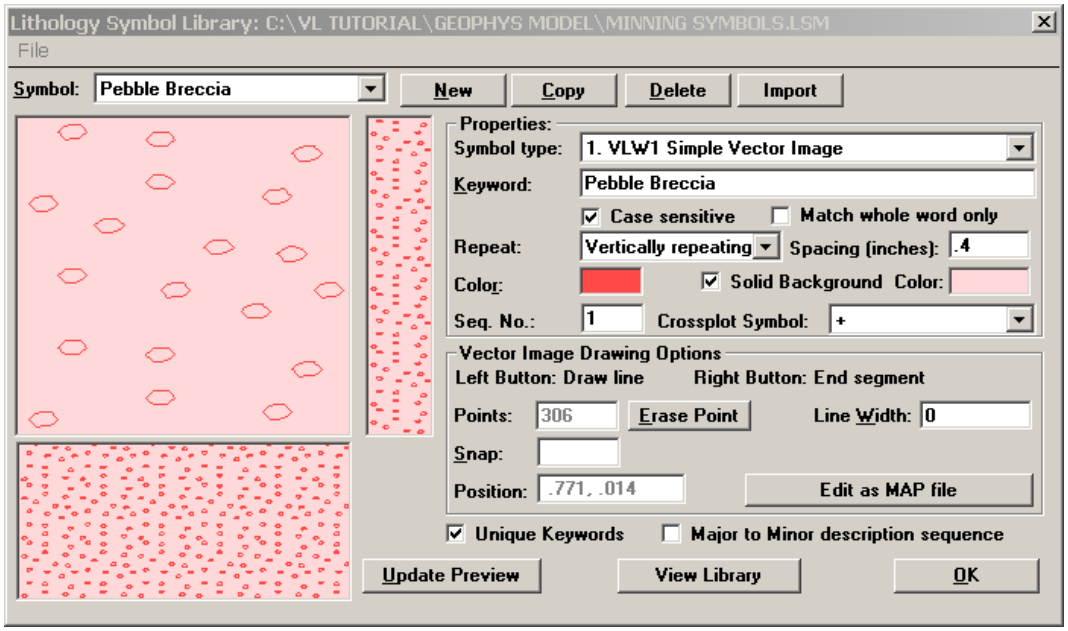
Adding interpretation to the log data is also crucial to analyzing geophysical logs. VIEWLOG provides functions for defining contacts and adding lithologic descriptions to the logs. When the file is saved, all descriptions are stored in the header file for later reference. Key words entered in the text descriptions can be used to create a lithology symbol column.



Adding Interpretation Text.

Lithology Symbols

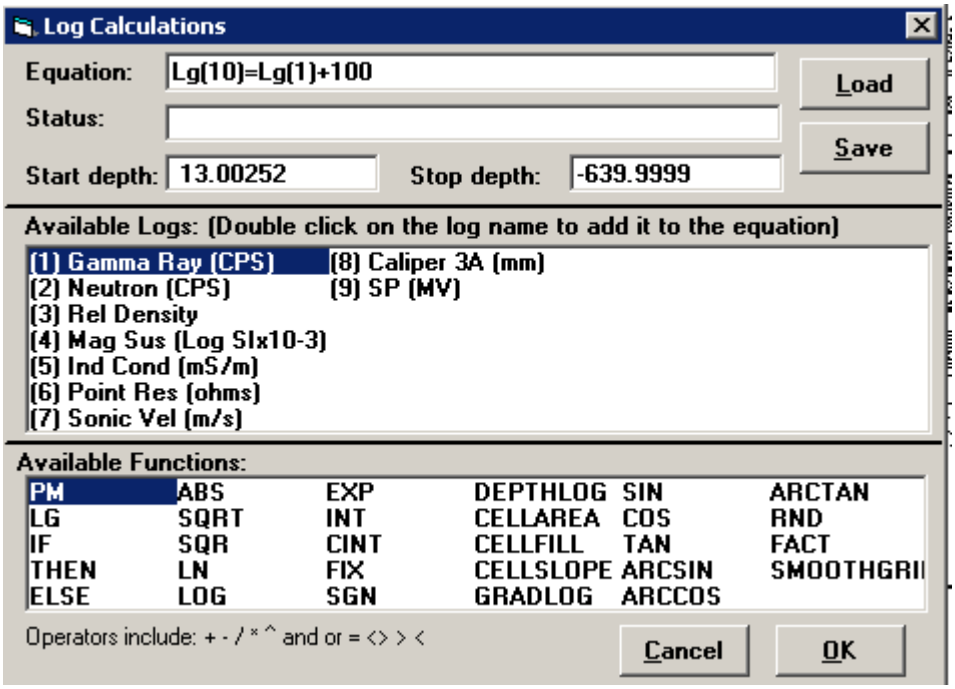
The interpretation text can be connected to geologic units in the Lithology Symbol Library, such that the different units are filled with different symbols. By entering interpretation text that contains keywords, VIEWLOG will search the lithology library, and subsequently fill the unit with the appropriate symbol. VIEWLOG has two default Lithology libraries: VIEWLOG.lsm (Default) and VIEWLOG MINING SYMBOLS.lsm. Both these libraries can be found in the tutorial directories and in the main program directory.



Lithology Symbol Editor.

Performing Log Calculations

Log calculations can be user defined by generating processing equations to generate new or corrected logs. The Log calculation function has support for a wide variety of mathematical functions (sin, cos, tan, abs etc.), including conditional statements (if then and else) and logical operators (and, or, not). Equations can even be applied to a limited depth interval to correct only portions of the log.



Log Calculations.

Log Output

Logs can be output into several different formats, including hard copy, jpg, pdf, and the Viewlog map format. When printing logs, VIEWLOG utilizes the current log scaling parameters as the default format. This simplifies output, as setting up the screen to display the logs, depth and scaling parameters is equivalent to setting the output format.

Saving Changes

During your log file editing session, it is important to note that any changes and interpretations are made only to data retained in the computer's memory. No changes will be saved until the program is directed to do so, allowing changes to be abandoned by exiting without saving the file. When log-editing changes are saved, all related parameters are written to disk, including editing changes, interpretation, and the configuration of the log display.

Introduction to Geologic Database Management

The database connectivity functions in VIEWLOG provide powerful tools for interacting with information stored in an open database structure. The Downhole Geophysics Tutorial provides an introduction to databases for VIEWLOG users.

Creating a Query in MS-Access

Because borehole locations and borehole depths may be stored in different tables, a basic database query that combines fields from these tables should be created. Common data stored in geologic databases includes Borehole ID numbers, Borehole Names, Eastings, Northings, Top

Elevations (ground surface or reference point), bottom hole elevations, top and bottom of monitors, and well construction details. Data will vary by database as the user decides what information is necessary.

A standard query for displaying boreholes in the VIEWLOG Map Editor combines the following fields: Borehole ID, Borehole Name, Easting, Northing, Top Elevation, Bottom Elevation. While strict order of fields in the query is not required, it is useful to keep the fields in the order as stated above. When the query is selected through the map editor for display, the fields will be automatically loaded into the correct locations.

Filtering a Query in MS-Access

Filtering queries provides the user with greater control over the data in the database. Within the query, boreholes can be selected according to any of the fields selected. As an example, the user can exclude boreholes that do not have top or bottom elevations.

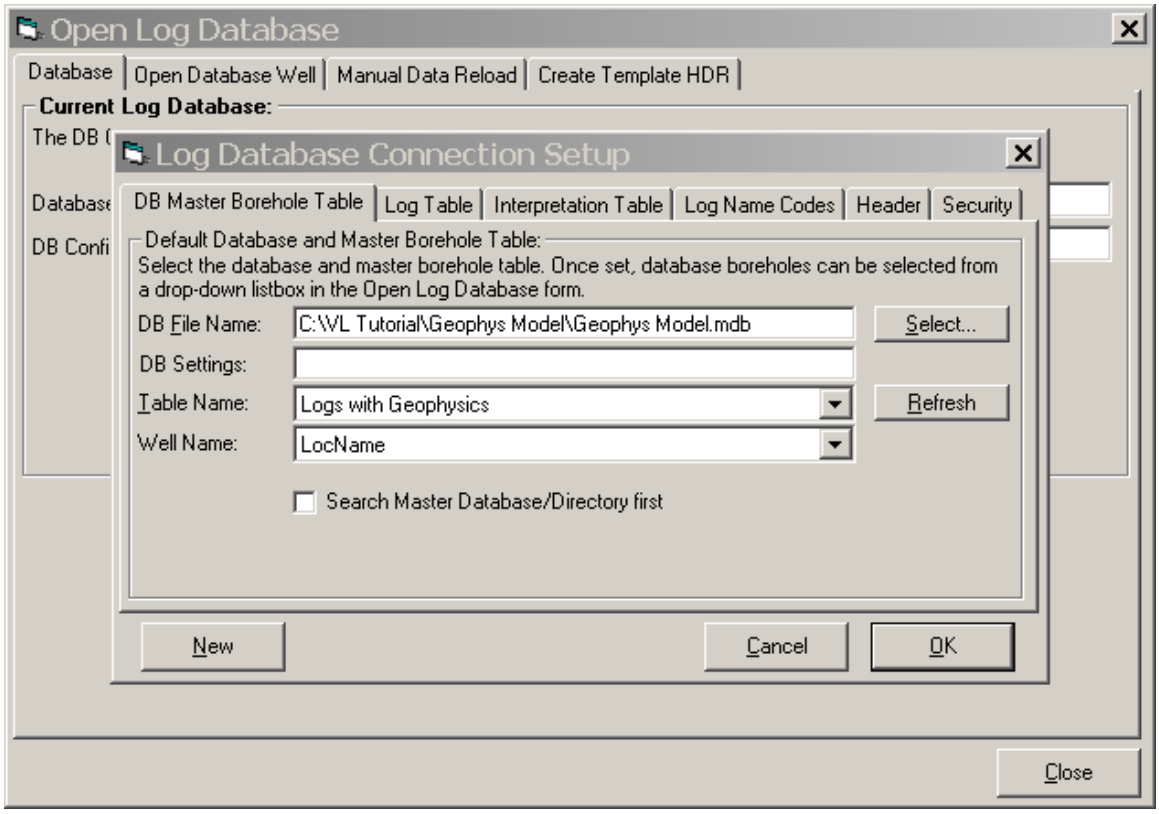
Introduction to Log Database Connectivity

Why Connect the Log Editor to the Database?

When both the data and related display parameters are stored in the HDR file structure, this is referred to as “stand alone” file management. Unfortunately, this it is not ideal for dealing with large numbers of wells. For those situations, database connectivity becomes essential.

To address this issue, the Log Editor can be connected directly to a database where no data is stored in the HDR file, and the HDR parameters are used, instead, as a template for formatting the borehole information as it is extracted from the database. Each log or interpretation column is linked to the database table or query, so that when the HDR file is opened VIEWLOG automatically extracts the required well data from the database.

The key to interpreting multi-parameter borehole data is data integration. It is truly a multivariate data set with varying correlations between physical parameters for different lithological units. Spreadsheets and most graphical display packages are primarily 2-dimensional, whereas geophysical borehole data is 4-dimensional (x, y, z position and physical parameter). To achieve easy access to data in a multi-well, multi-parameter setting requires construction of a relational database. In this type of setting it becomes relatively simple to test hypotheses on the basis of physical property, depth, location, or any combination of parameters.



Connecting to the Log Database.

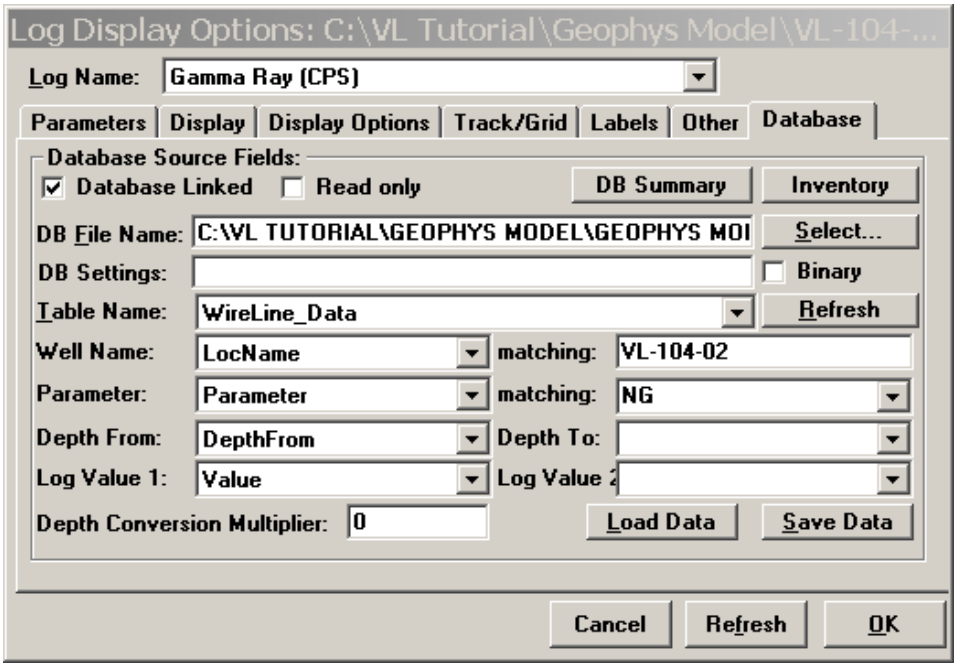
DB Configuration Files

The first step in connecting to a log database is creating a DB configuration file. By creating a DB configuration file, VIEWLOG will remember all the settings, linking the tables and queries in the user-defined manner.

When opening a log database in the VIEWLOG Log Editor, the menu provides several options to link to specific fields in the selected database. For example, data fields pertaining to Logs can be selected appropriately, as well as fields pertaining to Interpretation.

Creating Template HDR Files

It is very important to set up Log Templates, either for cross section or Log presentations. When using the Log Editor with a database, the first task is to select a well for use in setting up the display template settings. Typically, it is best to choose a well with detailed information. By selecting a representative well, it is easier to format and configure the log display.

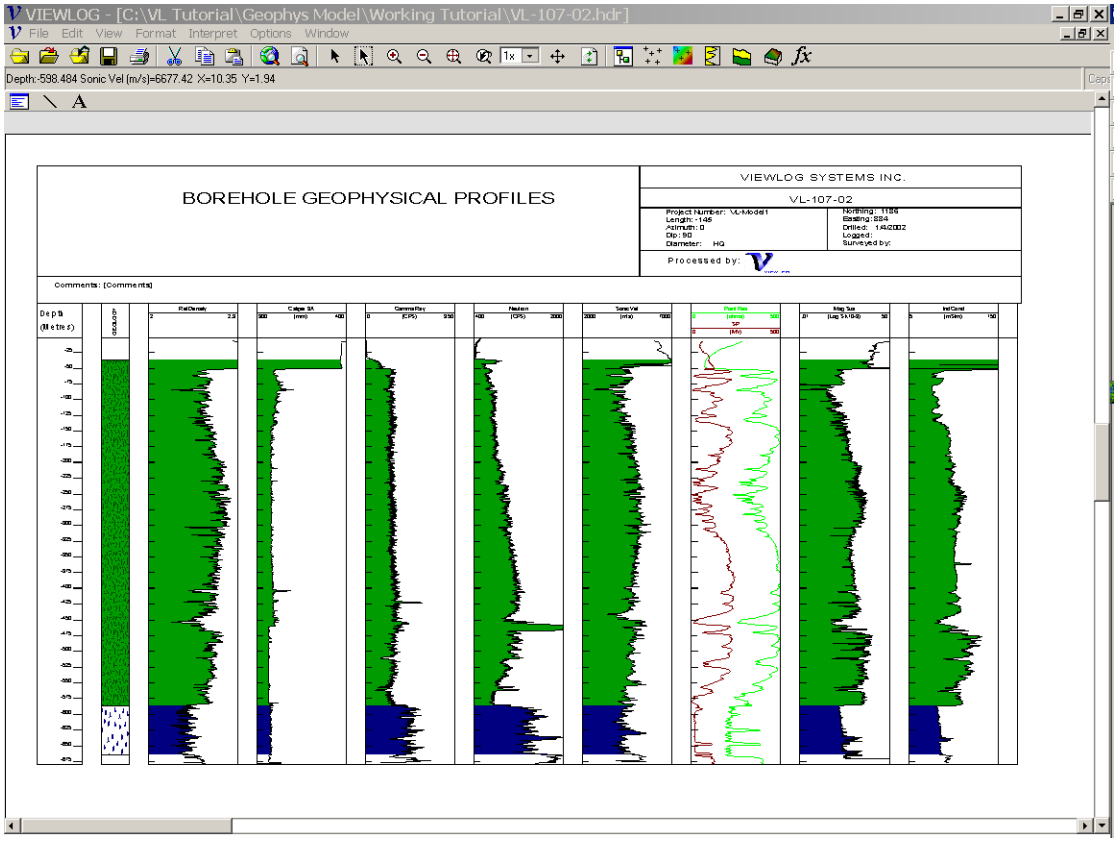


Creating Template HDR files.

Once the well is selected, a new HDR file is created. The unique well name or ID number is then entered in the Wellname Field in the Log Editor. This is critical because VIEWLOG will use this value to extract information from the database.

Creating and Linking a Header Template for Logs

Creating automated header templates for log reports is accomplished in the map editor. The header templates are then saved as a *.map file and “attached” to the log template (in the log editor) through Format/Page/Global setting/header image menu item. Selecting the header template in the file option and clicking the inline image button, will insure that the header template is always on top of the log tracks.


VIEWLOG - [C:\VL Tutorial\Geophys Model\Working Tutorial\VL-107-02.hdr]
File Edit View Format Interpret Options Window
Depth:-598.484 Sonic Vel (m/s)=6677.42 X=10.35 Y=1.94
BOREHOLE GEOPHYSICAL PROFILES
VIEWLOG SYSTEMS INC.
VL-107-02
Comments: [Comments]

Example Template HDR file.

Introduction to Geophysical Picking for Physical Rock Property Analysis

Geophysical picks are made, based on visual observations of how each parameter responds to a different lithology. This is called preliminary picking, whereby the log analyst establishes the basic boundaries between two very distinct and unique litho units. Secondary and tertiary picking, within the primary classifications, can be highly subjective and very dependent on the ability of the log analyst to accurately discriminate between slight changes in response per parameter AND the relationship of that response to the other parameters. The objective, via visual discrimination, is to establish UNIQUE lithoclasses as defined by all the parameters. This is usually done without the aid of the geological interpretation, thus making the geophysical interpretation unbiased.

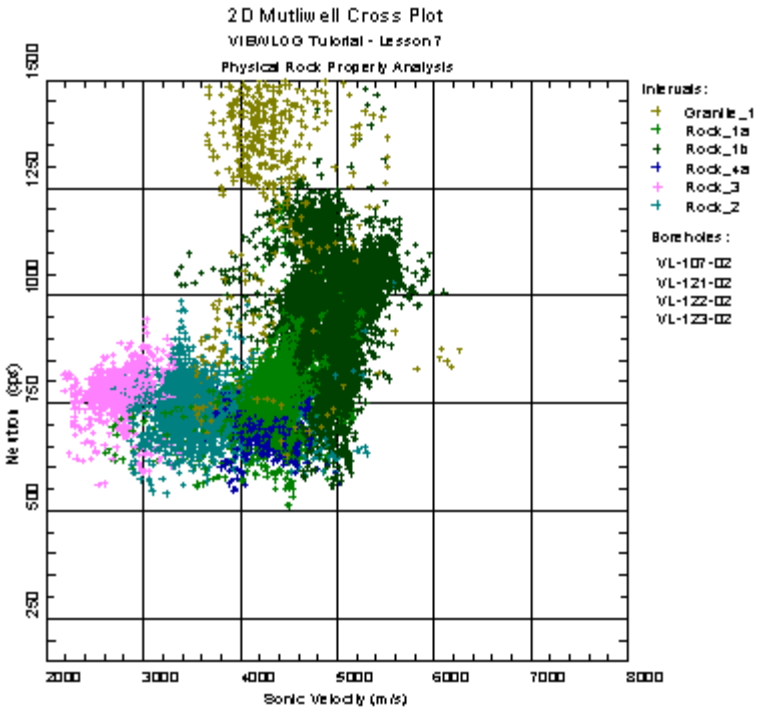
The VIEWLOG Log Editor makes it possible to visually pick lithologic units on the geophysical log. These picks can be saved directly back to the database. For more information please refer to the ***Downhole Geophysical Tutorial:*** Lesson 6: Geophysical Picking for Physical Rock Property Analysis.

Introduction to Physical Properties and Multiwell Cross Plotting

Cross-plots of two or more parameters, keyed to the geophysical lithoclasses give a visual check on the original geophysical boundary picks. The definition of a lithoclass is a UNIQUE grouping of measurements, as defined by a set of given geophysical parameters. The degree to which the class is unique, is established via visual discrimination from field plots and cross-referenced by cross plots.

> **Note:** To perform Multiwell Cross Plotting, the Multiwell Module for VIEWLOG is required.

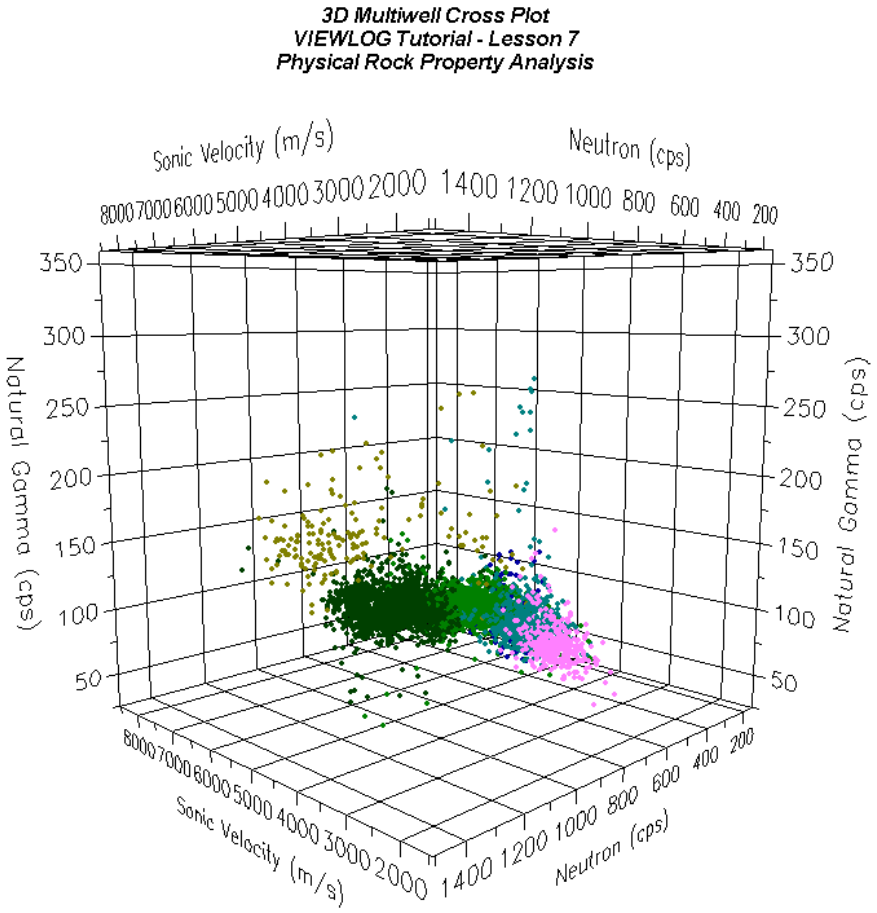
On a cross plot, a lithoclass is represented by a cluster of points. The degree to which the points cluster in conjunction with the extent of separation between the individual clusters defines the "uniqueness" of each lithoclass. In VIEWLOG there are a number of ways of presenting the data; from 2D plots and 3D plots of individual holes to multiwell cross plotting in both dimensions. 2D cross plots from single holes allow the log analyst to visually verify the geophysical picks and make the corresponding adjustments. Multiwell cross plotting allows for the integrated solution, by plotting a series of holes together, testing the association, relationship and more importantly the correlatibility of the lithoclasses across the body.



2D Cross Plot.

Cross plots also provide a visual cross-referencing methodology on the calibration and normalization procedures. Though many of the calibrations, for individual parameters are derived from predetermined processes, in many cases serious errors can result. Cross plots in

combination with composite plots provide a method of quality assurance and quality control, before the logging has been completed.



3D Cross Plot.

Note: For more information on physical rock property theory please refer to the Topic Reference guide in the Main VIEWLOG Help Menu.

For more information and a detailed tutorial on Multiwell Cross Plotting, please see the ***Downhole Geophysics Tutorial:*** Lesson 7: Physical Properties and Multi-Well Cross Plotting.

Introduction to Auto Classification/Prediction of Physical Properties

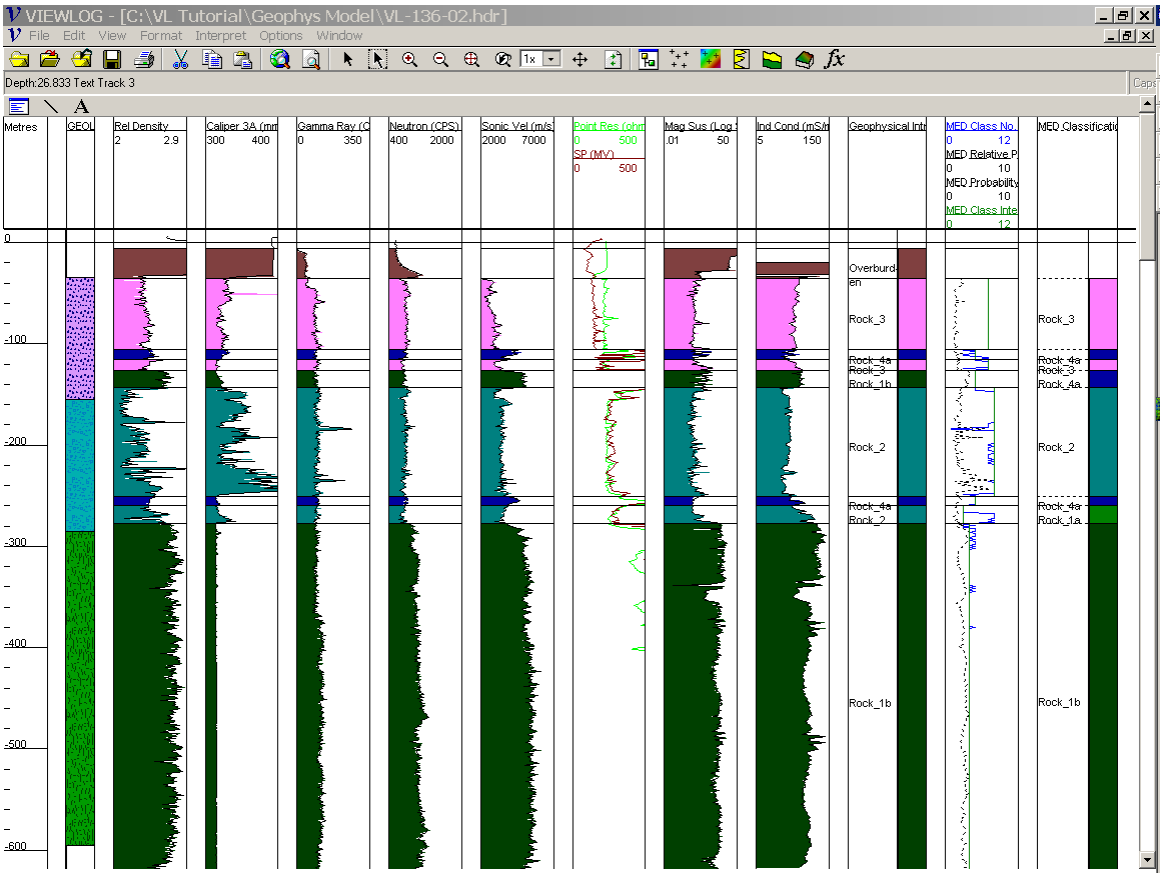
One of the main features of any exploration program is the drilling of exploration holes and defining the geology of the recovered core. This is usually accomplished via diamond drilling and can quickly account for the majority of any exploration budget. The use of reverse circulation drilling (i.e., no core recovery) can be viable alternative as the drilling expense is significantly less.

> **Note:** To perform auto classification of physical rock properties, the Multiwell Module for VIEWLOG is required.

However, defining the downhole geology from recovered chips can be a less than exact science. By initiating a downhole geophysical logging program at the onset of drilling, lithoclasses can be established (geophysical picking) and used as a method for predicting the geology in the subsequent reverse circulation holes planed in the next exploration season.

> **Note:** For more information on Classification/Prediction theory please refer to the Topic Reference guide in the Main VIEWLOG Help Menu

For more information and a detailed tutorial on Auto Classification/Prediction of Physical Rock Properties, please see the ***Downhole Geophysics Tutorial:*** Lesson 8: Auto Classification/Prediction of Physical Properties.



Example Auto Prediction.

Introduction to the Map Editor

The integrated Map Editor includes drawing, database and GIS functions optimized for the geosciences. In addition to acting as a CAD/GIS drawing system for interpreting and extending borehole data, interpretation can be performed using simple drawing tools or can extend to

comprehensive geological modelling. The Map Editor supports boreholes and 3-D surface and has integrated functions such as kriging, and cross sections can be easily generated along any chosen path through the project area, with all section interpretation performed in 3-D coordinate space. VIEWLOG Map Editor files (plan view and cross section) have the file extension “MAP”.

Editing Drawings

Once a drawing is created new or opened from file, it can be edited. Polylines can be drawn, text can be added, images can be linked, and files (for example .map, .shp, or .dxf) can be imported or linked. It is common to have roads, streams, railroads and political boundaries as .shp files to be linked into the drawing.

The Viewport

A viewport is used to display a portion of the World Coordinate system within a page. The page viewport can be thought of as a window to the world. Two parts of the viewport are defined: one in World and one in Page Coordinates. The world viewport defines the portion of the map or section that will be displayed. The Page viewport defines the position where the map or cross section will appear on the page. All objects in World Coordinates outside of the world viewport are hidden in Page View (the world viewport can be used to clip the map).

Map Views

Once a drawing is completed, the user may want to have a quick way to return to the exact settings of that drawing. Creating a map view of that drawing will store the settings exactly as they are. Double-clicking on the created map view in the map view menu will restore the settings to that of the created map view. There is no limit to the number of map views that can be created.

Map Text Fields and Automatic Titles and Legends

VIEWLOG map text objects can contain keywords that invoke powerful internal variables and advanced display properties. These include, for example, a keyword that automatically generates a map legend that dynamically adjusts depending on what map features are visible.

Map Text Fields are keywords, enclosed in square brackets and inserted in a text object. VIEWLOG has a number of text fields built into the Text Attributes window (to access this window, use **Edit/*Text Attributes*** once you have selected an existing Text object, or, with new text, use the **Draw/*Text***, and click the left mouse button in the area you want text to appear – this will open the Text Attributes window for the new text). Regular text can be combined with the Insert Fields

> **Note:** For more information on VIEWLOG and Advanced Mapping and GIS capabilities please refer the VIEWLOG Main Help Menu.

Introduction to VIEWLOG Projects

VIEWLOG is designed so that only one copy of each field measurement is stored in the database. Centralized storage offers numerous benefits, including improved error tracking, reduced data volume, and simplified data backup.

While the database provides centralized field data storage, a corresponding system was required to manage the information on multiple maps and cross-sections that make up the interpretation of the data. VIEWLOG Project files provide the key linkage between the database, the geologic interpretation, and the numerous maps and cross-sections. Most important, Project File objects link the following:

- Raw data stored in the database
- Display appearance for plan, section and 3-D views
- Interpretation and interpolation results, and
- Processing and analysis functions

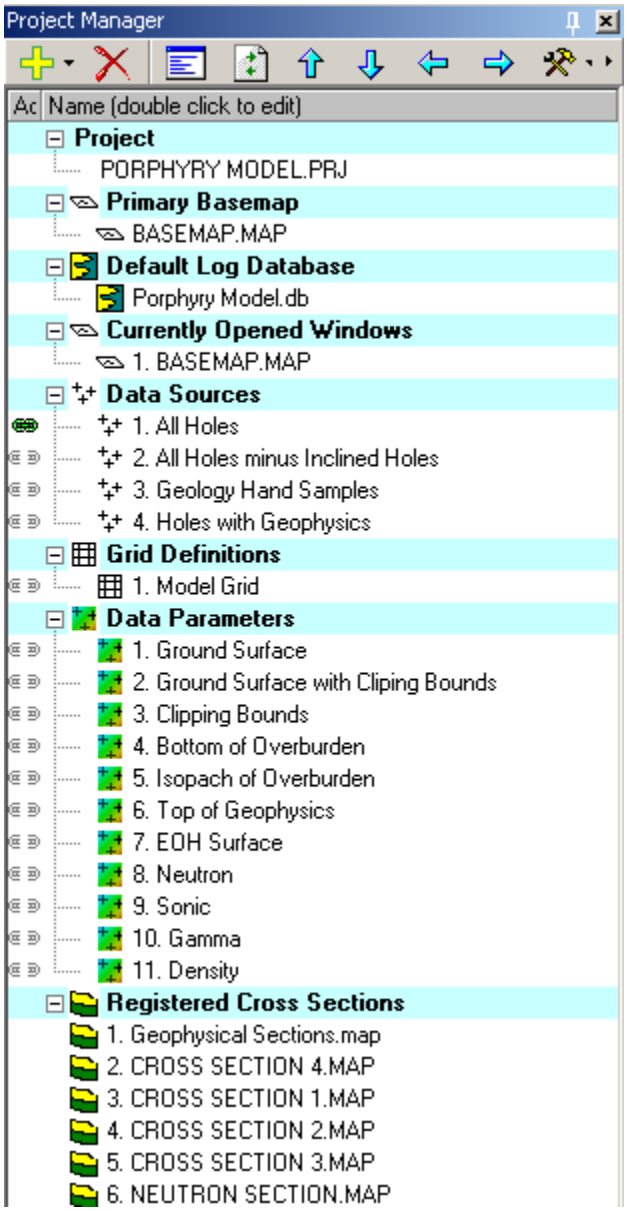
Setting up a Project

Creating a Project file will allow links with the database and common elements of the geologic model to be stored. Objects in the Project file can be viewed in multiple maps and cross sections at the same time. While multiple maps can be open at the same time, only one project can be open in VIEWLOG at one time.

Registering a Base Map

It is important to remember to register your base map(s) and Cross Sections in the Project Manager. Registering a map links the map to the Project file.

Note that a Project file can be linked to multiple map and cross section files. Updating a Project file will automatically update all linked maps and cross sections.



The Project Manager.

Introduction to Data Sources

Data Sources contain information about a group or class of boreholes or monitoring intervals and provide a logical structure for organizing, displaying and processing these data. Groups can be defined on any basis and use a database table or query for selection. Data Sources bring together the database link, display options, geologic display and editing and some grid-based processing functions.

While Data Sources are frequently used to define a group of boreholes that fall in one geologic formation, they are generally not used to classify measurements made in that formation. Data Parameters are used for that option.

The Data Source structure is very flexible, and because it contains a link to a database, as new boreholes are added to the database, they will automatically be added to the Data Source if they meet the conditions defined in the Data Source table or query.

Data Sources are used for:

- Borehole Location Management and Posting
- Grouping of Monitoring Information
- Linkage to HDR file for Geologic Information
- Database Linkage for on-section geologic unit picking
- Writing gridded (interpolated) information back to fields in the database

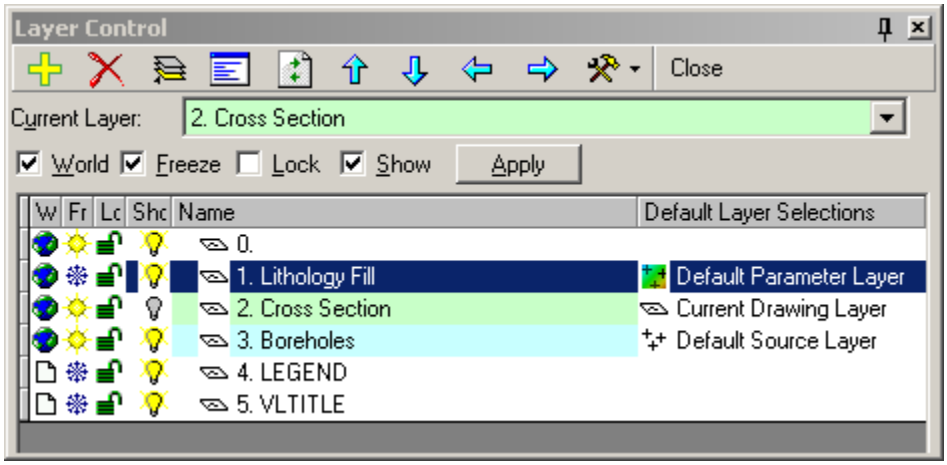
Before a Data Source can be created, it is necessary to link the map to a Project file. This allows the database links that will be created in the Data Source to be saved in the Project file.

Creating a Data Source

Before a Data Source can be created, it is necessary to link the map to a Project file. This allows the database links that will be created in the Data Source to be saved in the Project file. For a Data Source to be visible, it must be activated, the layer on which it is activated must be visible, and the display options must be set appropriately. Each time you create a new Data Source, you must fill in the appropriate information. Following the nine tabs in order in the Data Source menu will ensure that the user remembers to fill in the appropriate information.

Layers

VIEWLOG has a layer menu that functions in a similar way to an AutoCAD layer menu. Layers can be frozen or unfrozen, visible or invisible, locked, unlocked, used in World Coordinates or Page Coordinates. Viewlog will allow the use to select and work with objects as an individual layer or as groups of layers. The user cab also use the arrange functions to control drawing order of objects within a layer.



Layer Menu.

Data Source Menu

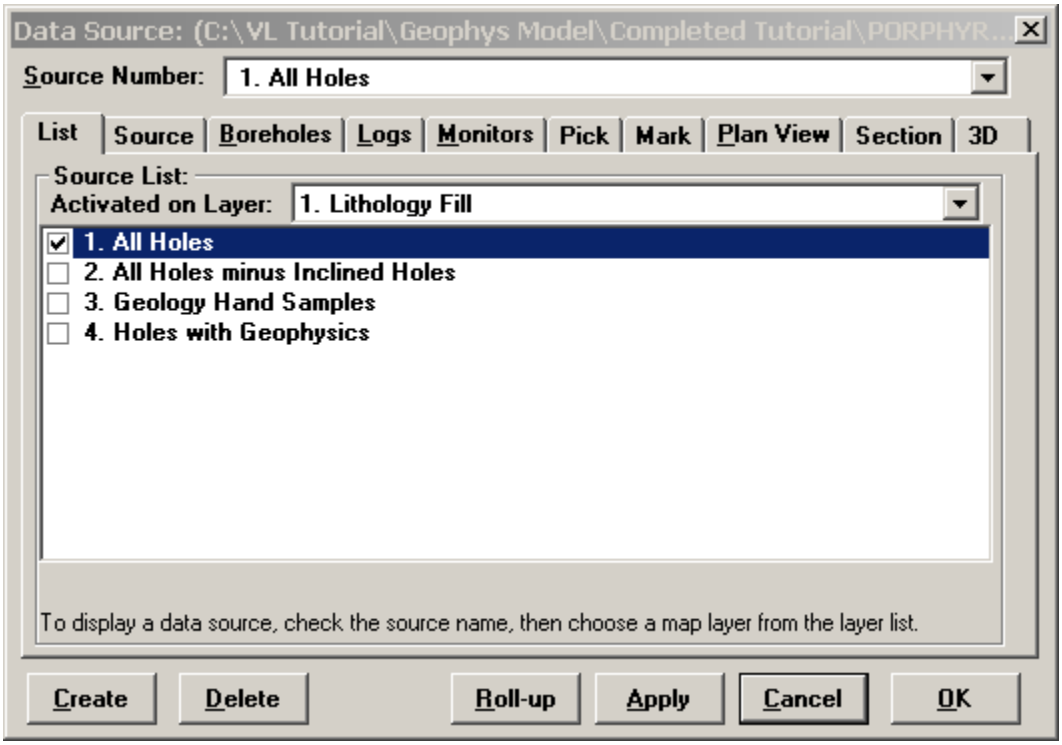
The Data Source Menu consists of ten tabs that control the properties and display of a Data Source. Six are described below; the remaining four will be discussed in another section.

The **List** tab displays the existing Data Sources and allows the user to check them on and off.

The **Source** tab defines the name of the Data Source and the basic database connection parameters.

The database table and fields are selected in the Boreholes tab. To view borehole locations in plan view, the name, ID, and location fields should all be linked to database fields. For viewing boreholes in cross section, the elevation field must also be linked. All other fields are optional.

The **Logs** Tab contains a HDR file field that is used to link a VIEWLOG HDR file to the borehole, and a default HDR file can be defined for all wells in this source. The Logs tab allows the user to specify two different HDR files. The first is used to present borehole logs on cross section and the second is used to show borehole logs in preview mode. If the second HDR file is left blank, logs will be shown in preview mode using the default Template HDR.



Data Source Menu.

In the Data Source window, the **Plan View** tab is used for formatting and display of the borehole information on plan-view maps.

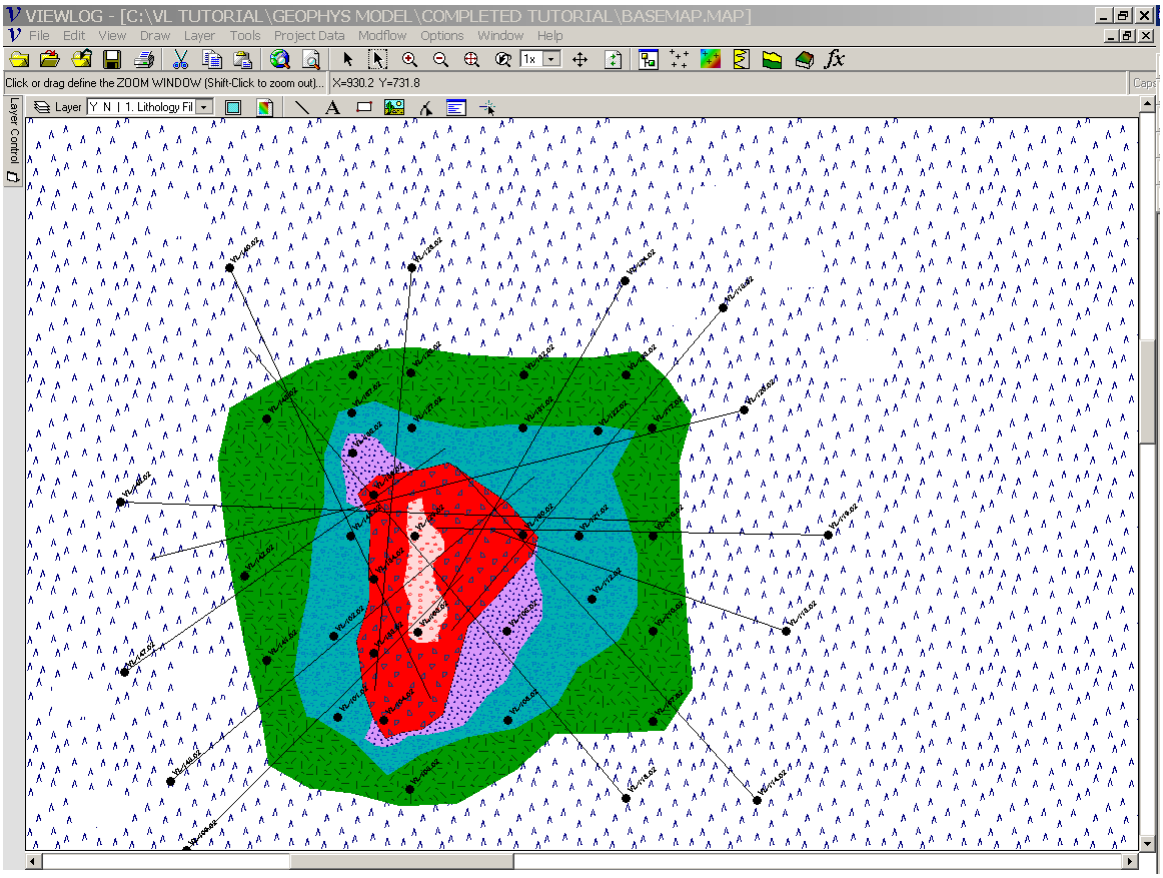
The **Section** tab controls the display of the well information on cross sections.

Displaying Boreholes on the Map

Once the above tabs have been completed, the information is ready to be displayed on a map. It is possible to filter out boreholes based on criteria entered into the filter section of the boreholes tab. For use of the filter, please see the ***Geologic Modelling Tutorial:*** Lesson 5: Working with Data Sources or the ***Downhole Geophysics Tutorial***: Lesson 11: Working with Data Sources.

Selecting and Editing Borehole Details

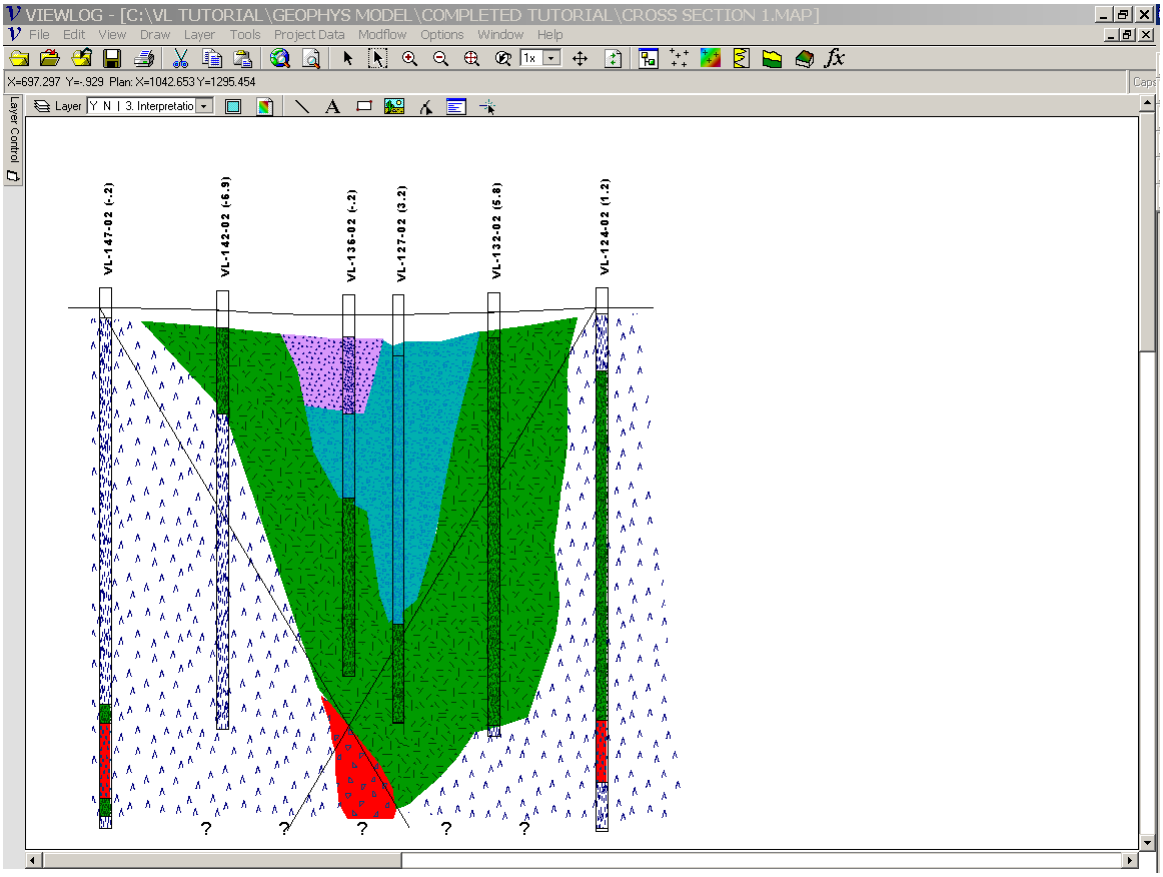
The borehole information, including ALL fields in the Data Source query or table, can be displayed within VIEWLOG as a floating table window. Because all fields in the table or query are available, the user can add easily add related fields for editing. Editing changes are immediately written back to the database.


VIEWLOG - [C:\VL TUTORIAL\GEOPHYS MODEL\COMPLETED TUTORIAL\BASEMAP.MAP]
File Edit View Draw Layer Tools Project Data Modflow Options Window Help
Click or drag define the ZOOM WINDOW (Shift-Click to zoom out)...
X=930.2 Y=731.8
Layer Control

Displaying Borehole on a Map.

Cross Section with Boreholes

Creating Cross Sections is an integral part of any Geological Model. Boreholes can be displayed in cross-section, and display properties are controlled by the **Section** tab. Headers for the display of borehole log information are selected in the **Logs** tab.


VIEWLOG - [C:\VL TUTORIAL\GEOPHYS MODEL\COMPLETED TUTORIAL\CROSS SECTION 1.MAP]
File Edit View Draw Layer Tools Project Data Modflow Options Window Help
VL-147-02 (-.2)
VL-142-02 (-6.9)
VL-136-02 (-.2)
VL-127-02 (3.2)
VL-132-02 (5.8)
VL-124-02 (1.2)

Displaying Boreholes on Section.

Data Source Browser

The Data Source Browser, located in the **Tools** menu, provides a preview of a selected borehole using a header template specified in the Data Source.

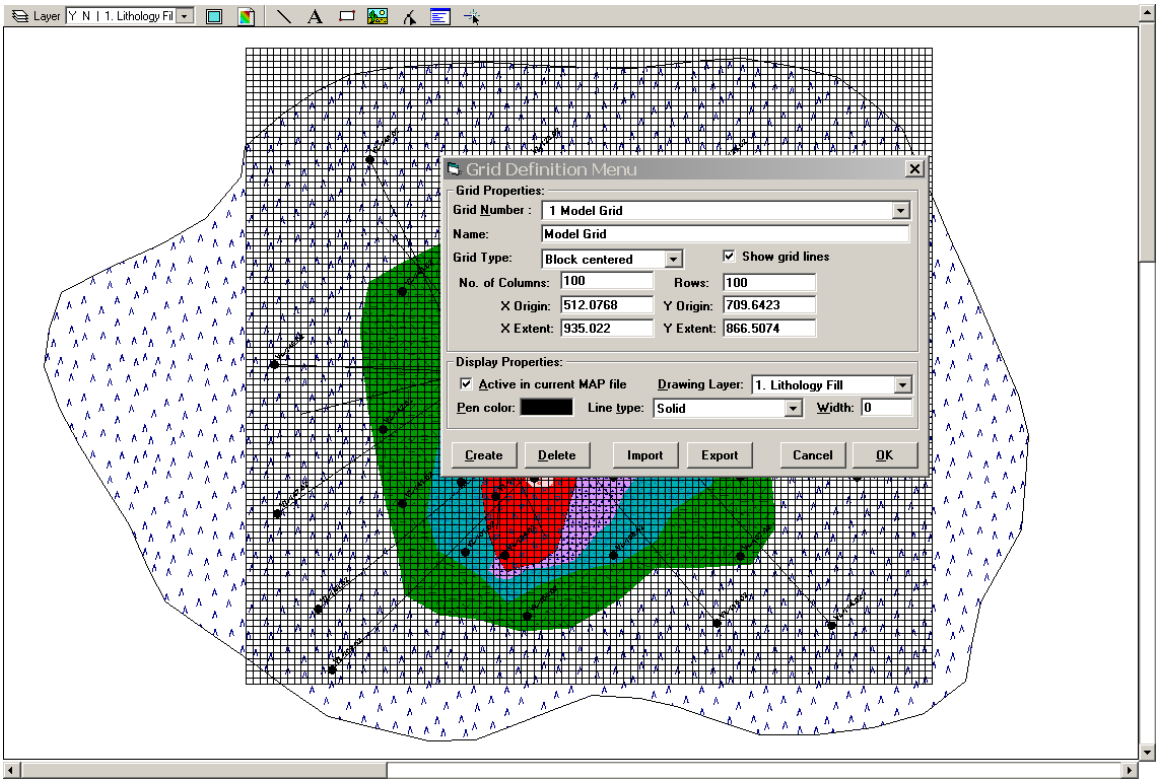
Introduction to VIEWLOG Grids

VIEWLOG grids are used to direct the interpolation process. Interpolation consists of two elements: a grid definition, and a file containing the interpolated results at each grid cell. In the Drawing Editor, the Grid menu is used to define one or more grid definitions. A grid definition includes information about the position and number of rows and columns in a grid. The interpolation process is controlled through the Data Parameter menu.

Creating and Displaying Grid Definitions

In general, it is good idea to carefully define (and refine) your grid definitions early in the project. Major changes to a grid later in a project may require that each parameter be re-interpolated to a revised grid definition. Re-interpolation is not a difficult task, but can take a lot of processing time.

Before a Grid Definition can be defined, it is necessary that the user has previously set up a map with project links and a Data Source. After creating a new grid, it is a good idea to give it a descriptive name.



Example of Defining a Grid.

There is no limit to the number of grids that can be created. Different grids can be used for different study areas in a large region. Alternatively, one grid can be used, and cell sizes adjusted or "refined" in areas of interest. New grids are initially created with uniform cell sizes, depending on the number of rows and columns in the grid and the X and Y extents of the grid.

Moving a Grid

Moving a grid is accomplished by redefining the X and Y origin in the Grid Definition window. The grid refinement, and all settings, will be preserved.

Editing and Refining a Grid

By default, grid definitions have uniform cell sizes. The ability to refine a grid is a very powerful feature, as it allows smaller cell sizes in areas of interest. For example, a grid with large cells could be defined to cover the entire study area, and then cell size can be refined in zones where there are many boreholes. This provides detail only in zones of interest, and provides a seamless transition from the local to the regional scale.

Introduction to Data Parameters

Data Parameters are used to manage any mappable field measurement. Examples include geologic surfaces, water level snapshots, rock properties, etc. The Data Parameter menu brings together a database link, gridding and interpolation details, and plan-view, section and 3-D display options.

Creating a New Data Parameter

Commonly, Data Parameters are created by linking to the database holding the information for that parameter. The Data Parameter Menu has ten tabs that control the interpolation and display of the Data Parameter. Seven of the ten tabs are described below.

The **List** tab contains a list of the available data parameter, that can be turned on and off by checking in the box.

The **Name** tab allows the user to specify a name for the parameter and record any notes about the parameter.

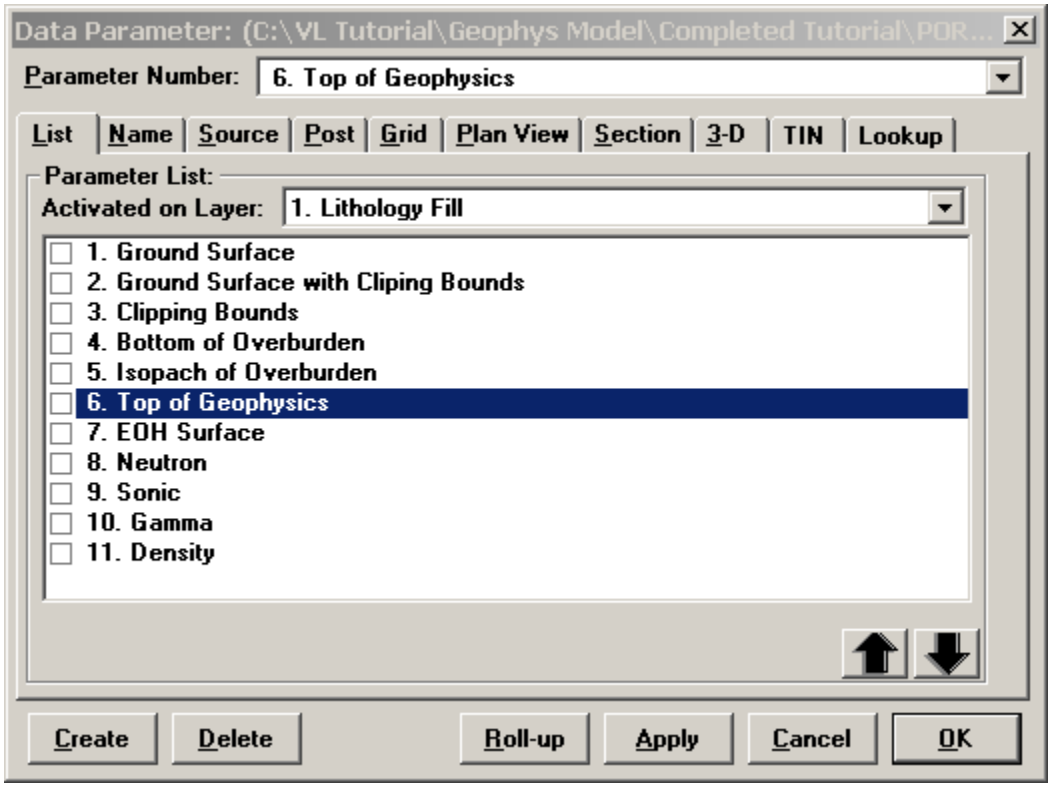
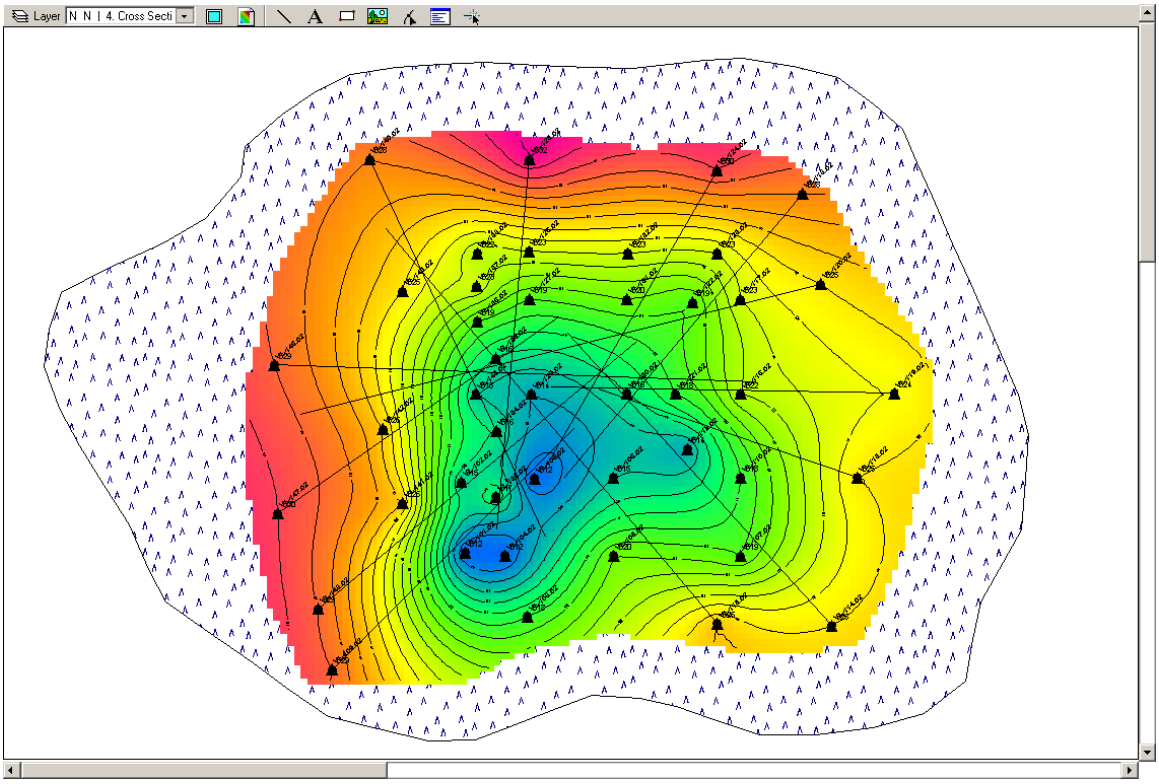


Figure 1: Data Parameter Menu

The **Source** tab links the parameter to a data source to be interpolated. If this tab is left blank, data is selected in the Grid tab.

The **Post** tab will show in plan view the locations of the data points to be interpolated.

The **Grid** tab performs the interpolation and outputs the .grd file with the completed interpolation.



Example of Gridded Data.

The **Plan View** tab controls the display of the interpolated data. Contours are set here.

The **Section** tab controls the display of the interpolated data in cross section view. This includes colour shading between two surfaces, called surface pairing.

Clipping Gridded Data

Another useful feature is the use of a closed polygon to clip the data. This allows the user to show only gridded data within a desired area, and is done by creating a new Data Parameter on the same grid. In this new parameter, each cell will be assigned either a 1 or a 0; areas assigned to 0 will not be shown.

For more detail on clipping gridded data, please see the ***Geologic Modelling Tutorial:*** Lesson 6: Working with Data Parameters, or the ***Downhole Geophysics Tutorial:*** Lesson 13: Working with Data Parameters.

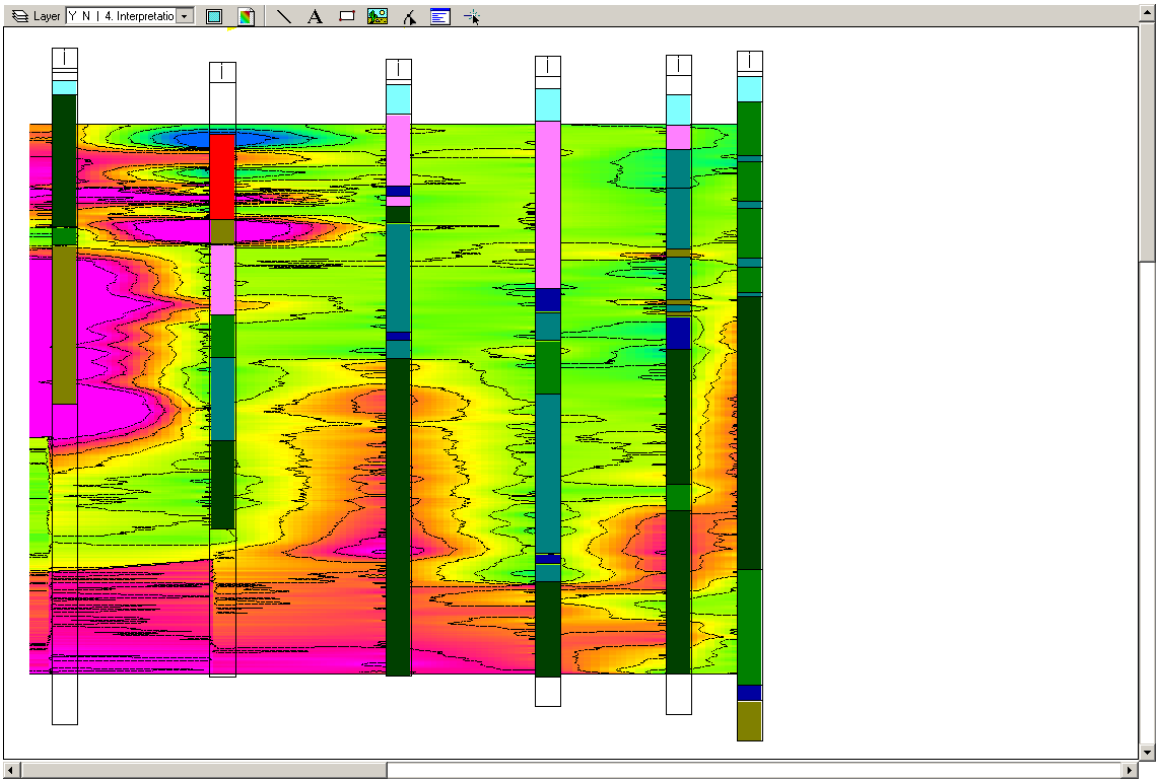
Parameter Calculator

The Parameter Calculator allows the user to relate one surface to another using mathematical functions. For example, if the bedrock surface is subtracted from the ground surface, it would create a parameter that contains the thickness of a unit. This is referred to as an isopach map, and in this example refers to thickness of overburden.

The Parameter calculator can perform calculations on any existing parameter. The output of the parameter calculator is a new parameter that is displayed through the Data Parameter menu.

Introduction to Gridding on Section

We the availability of Downhole geophysics it may become important to krige the physical property values on section as a method of visualizing the changes in physical properties across a given section.

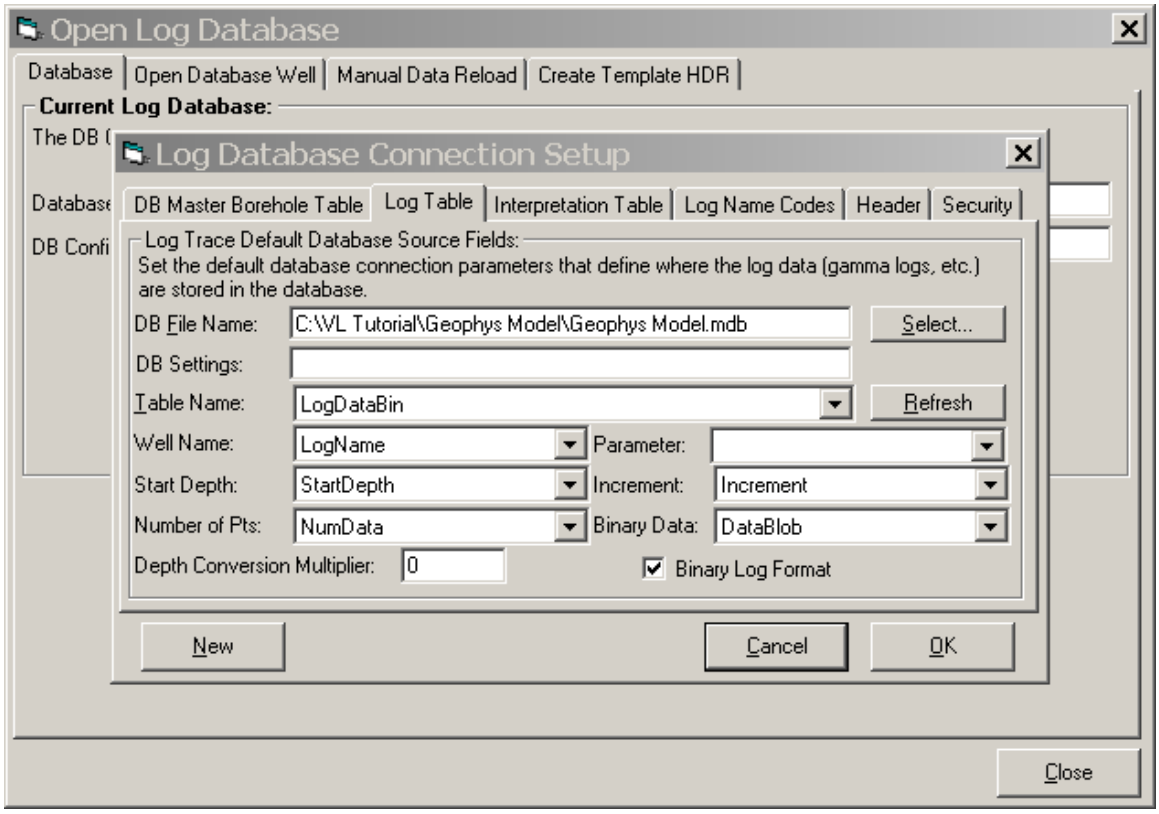


Example Gridding on Section.

For a detailed tutorial of gridding on section, please see the ***Downhole Geophysics Tutorial:*** Lesson 14: Gridding on Section.

Introduction to Log Data Stored as Binary files

Often when there are large amounts of downhole geophysical information stored in ASCCI file format, the database can become exceedingly large very quickly. Viewlog offers the option to store this data in binary format.



Example of Log Binary Storage.

Specific table structures are required which will allow this user to convert the ASCCI data in binary blobs. For further information on the format of the binary storage please refer to the VIEWLOG Topic Reference in the Main Help Menu. Note that VIEWLOG will also convert a multitude of other formats, including ASCCI, LAS etc.

Log Data is converted using the Log Database Connection Setup menu, which is accessed by importing the file into an empty log file.

Geologic Modelling Tutorial

Introduction to data management and guide to generating 3-D surfaces, cross sections, and borehole log display.

Introduction to Geologic Modelling Tutorial

VIEWLOG provides an integrated system for borehole data management and interpretation and geological modelling. Project Management in VIEWLOG offers the means to fully integrate the data for effective, interactive and enhanced analyses. Data storage is built on an open, relational database structure, which can be fully customized by the end user. VIEWLOG can simultaneously access the data, allowing real-time, interactive query setup and display. By tightly coupling a powerful borehole Log Editor with GIS-style mapping and 3-D cross-section tools in the Map Editor, VIEWLOG offers an unrivaled level of visual interpretation control.

VIEWLOG Project Management

Project files: *.PRJ

The database and geologic modelling functions in VIEWLOG are organized through the Project file. The Project file contains the common elements of the geologic model and all primary links to the database. In the Project file, objects such as 3-D surfaces can be simultaneously viewed on multiple maps and cross sections.

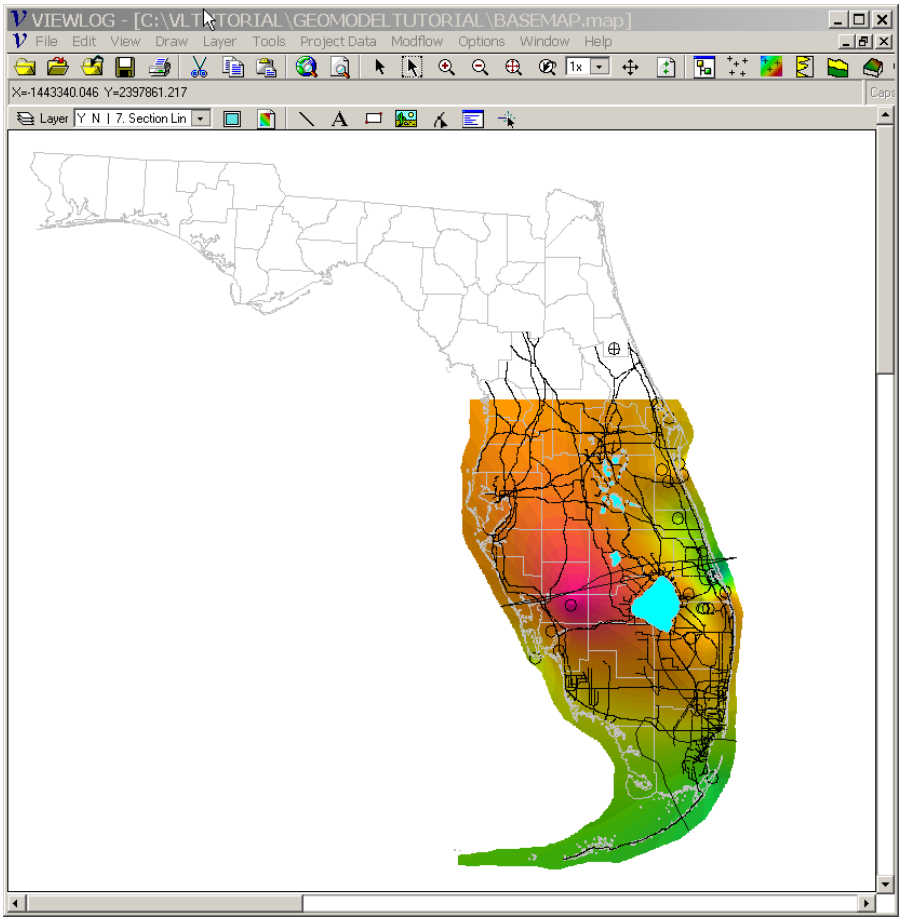
Microsoft ACCESS Database: *.MDB

Microsoft ACCESS is the most commonly used desktop database with VIEWLOG. Other databases, such as Oracle and SQLServer can also be connected to VIEWLOG. In addition, spreadsheet files (e.g., MS-EXCEL, *.XLS extension) can be connected to VIEWLOG.

VIEWLOG Map Editor

Maps and Cross Section Lines and Text: *.MAP

The integrated Map Editor includes drawing, database and GIS functions optimized for the geosciences. The Map Editor acts as a CAD/GIS drawing system for interpreting and extending borehole data. Interpretation can be performed using simple drawing tools or comprehensive geological modelling. The Map Editor supports high-level objects, such as boreholes and 3-D surfaces and includes integrated functions such as kriging. Cross sections can be easily generated along any chosen path through the project area and all section interpretation is performed in 3-D coordinate space. VIEWLOG Map Editor files (plan view and cross section) have the file extension “MAP”.


VIEWLOG - [C:\VLTUTORIAL\GEOMODELTUTORIAL\BASEMAP.map]
File Edit View Draw Layer Tools Project Data Modflow Options Window Help
X=-1443340.046 Y=2397861.217
Layer Y N I 7. Section Lin

The VIEWLOG Map Editor.

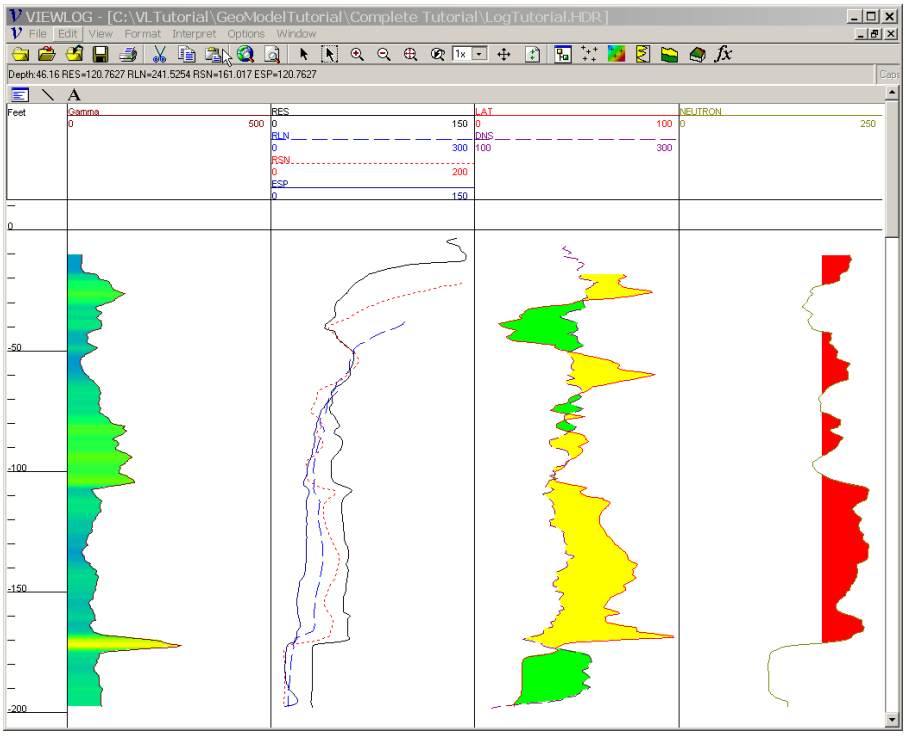
Gridded Interpolation Results: *.GRD

The interpolation of borehole measurements produces a parameter estimate at every grid cell location. This information is stored outside of the database because it is secondary or "derived" from the raw measurements. These files, which contain the *.GRD extension, can be quite large, depending on the number of cells in the grid.

VIEWLOG Log Editor

Well Log Headers: *.HDR

The Log Editor is used to integrate, display and interpret various downhole measurements ranging from geophysical logs, core descriptions, chemical analysis, water levels and core photos. The Log Editor is used to correct, interpret and prepare data for stratigraphic correlation, mapping, and geological modelling. Log data files typically have the file extension *.HDR, which is an abbreviation for "Header". The HDR files contain information about the well, including a list of all logs from that well.



The VIEWLOG Log Editor.

Downloading and Installing the Tutorial Files

The self-extracting file will unpack all the files required by the tutorial into a main directory called C:\VL Tutorial. The subdirectory c:\VL Tutorial\GeoModelTutorial\ contains the basic files needed to complete the following lessons. The subdirectory C:\VL Tutorial\GeoModelTutorial\Complete Tutorial contains the completed VIEWLOG tutorial project for reference purposes. C:\VL Tutorial\GeoModelTutorial\Shape Files contains the shape files for generating the base map.

TASK: Download and install the tutorial files.

> **Note:** It is very important to unpack the files to the C:\ directory in order for the tutorials to open correctly.

PROCEDURE:

1. Place Tutorial.exe to a temporary directory of your choice.
2. Click on the file.
3. Unpack all the files to C:\. This will automatically unpack all the files and subdirectories to a directory called C:\VL Tutorial.

> **Note:** When completing the tutorial it is important to save YOUR work in the C:\VL Tutorial\GeoModelTutorial\ directory. **Do not to overwrite anything in the C:\VL Tutorial\GeoModelTutorial\Complete Tutorial directory,** because this directory contains all the necessary files for the completed VIEWLOG tutorial project for reference purposes.

Lesson 1: Getting Started in the Map Editor

Creating a New Drawing

The first task is to open a new drawing file.

TASK: Create a new VIEWLOG drawing file.

PROCEDURE:

4. From the main VIEWLOG menu, select **File/**New drawing.
5. By default, the new drawing has the dimensions of the currently defined printer page. Select **View/**Zoom Out (shortcut: **F5**) to see the whole page. The area outside of the printer page is gray, while the page area is white.
6. To change the dimensions of the page, select **File/**Page Setup, and change the **Width** and **Height** of the page.

> **Note:** New drawings are opened in Page coordinates (where units are in inches or cm). For a discussion on Page and World coordinates, see Page View.

Drawing Polylines in the Map Editor

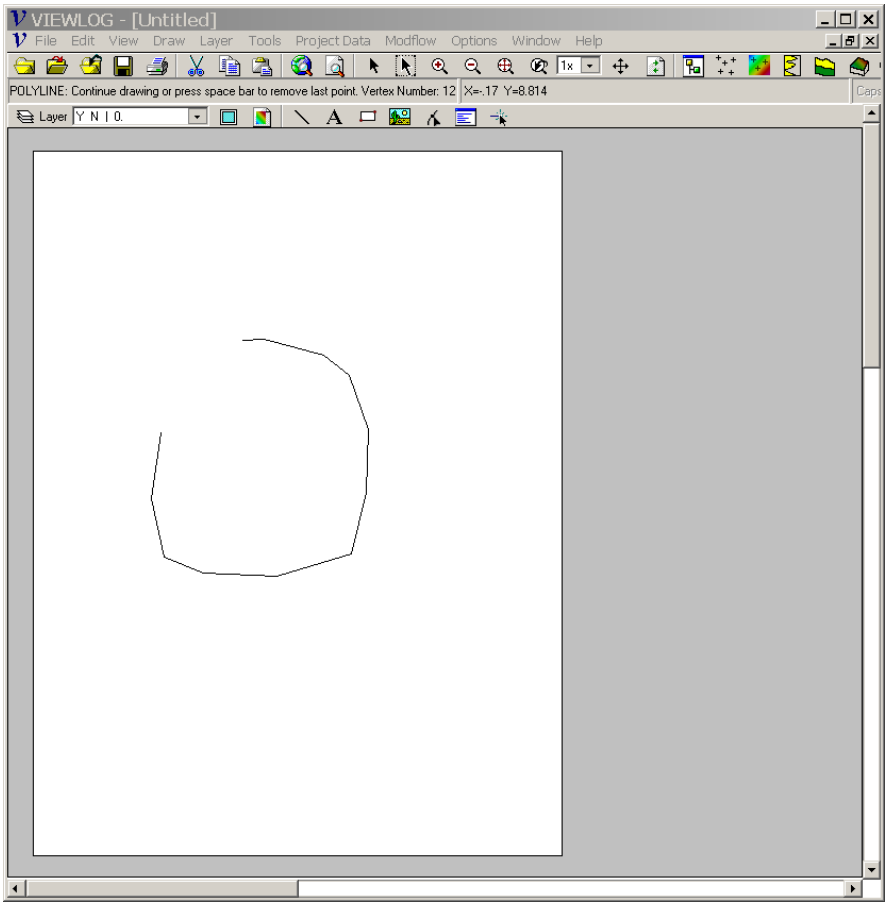
In the Map Editor, polylines and polygons can be used for simple tasks (e.g., drawing roads), or more complex tasks (e.g., providing the basis for creating cross sections). For more information, see Polyline node functions.

TASK: Add a polyline.

PROCEDURE:

7. To draw a simple polyline, select the **Draw/**New Polyline menu item (or click on the icon).
8. Repeatedly click and move the mouse to draw a line on the page. An example is shown below.

> **Note:** To create a closed polygon, the first and last point of the polylines can be connected by setting the "closed" attribute option. To edit the attributes of the polyline, select the line (click the icon, then click on the line to select it), right click the mouse, and select **Display Properties**. This **Attributes** window can also be used to edit the color and thickness of the line, and to fill the polygon with a solid color or pattern.


VIEWLOG - [Untitled]
File Edit View Draw Layer Tools Project Data Modflow Options Window Help
POLYLINE: Continue drawing or press space bar to remove last point. Vertex Number: 12
X=-.17 Y=8.814
Layer

Drawing a New Polyline.

Note: When drawing new polylines, the attributes (line color, thickness etc.) of the previously drawn polyline will be used by default.

Adding and Removing Polyline Nodes

Once a polyline is drawn, VIEWLOG contains several node functions that allow the user to edit, add or remove individual nodes within a polyline (see Edit Polyline Nodes).

TASK: Edit polyline nodes.

PROCEDURE:

1. Select **Edit/**Edit Polyline Nodes (Shortcut: **Ctrl+N)**.
2. Click on the desired polyline. You should see a small square to indicate the location of each node.
3. To move a node, use the mouse to click/drag the node to a new location.
4. To add a new node, hold the **Shift** key, and click at the new location.
5. To remove a node, hold the **Ctrl** key and click/drag an existing node.

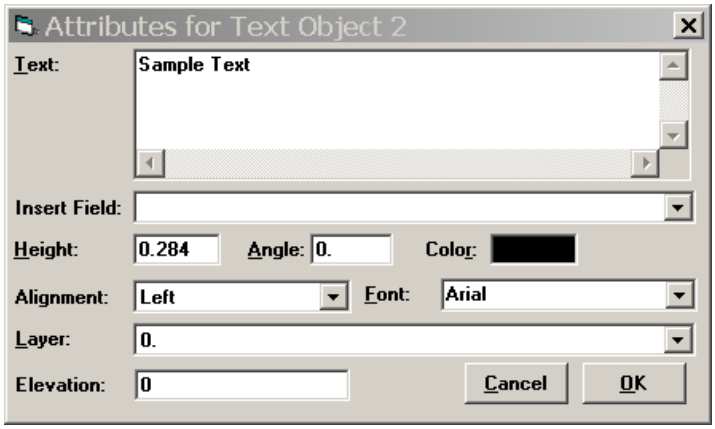
Adding Text in the Map Editor

The Text Attributes window can be used to add and edit text in the Map Editor.

TASK: Add text.

PROCEDURE:

1. To add text to the drawing, select **Draw/**Text Attributes (or click on the icon).
2. Click at the desired location of the text and enter the text in the Attributes window, as shown below.



Entering Text.

3. Click on **OK** to exit the Attributes window.

> **Note:** To define the text angle interactively when adding text, select **Draw/*Text*** (or click on the icon) and click and drag the mouse to define the text orientation. The text angle will be set to the angle defined by the click and release point.

Moving and Scaling Objects

When working in the Map Editor, it is often necessary to move or re-size an object, such as a polyline.

TASK: Move and re-size map objects.

PROCEDURE:

1. Select the polyline you have drawn. To do this, click on the icon, and click on the line (once an object has been selected, a dashed line will appear around the object).
2. To move the polyline to a new location, press and hold the **Ctrl** key, and left-click/drag the mouse
3. To interactively scale the polyline, left-click/drag the mouse along one of the four corners of the box that encompasses the polyline.

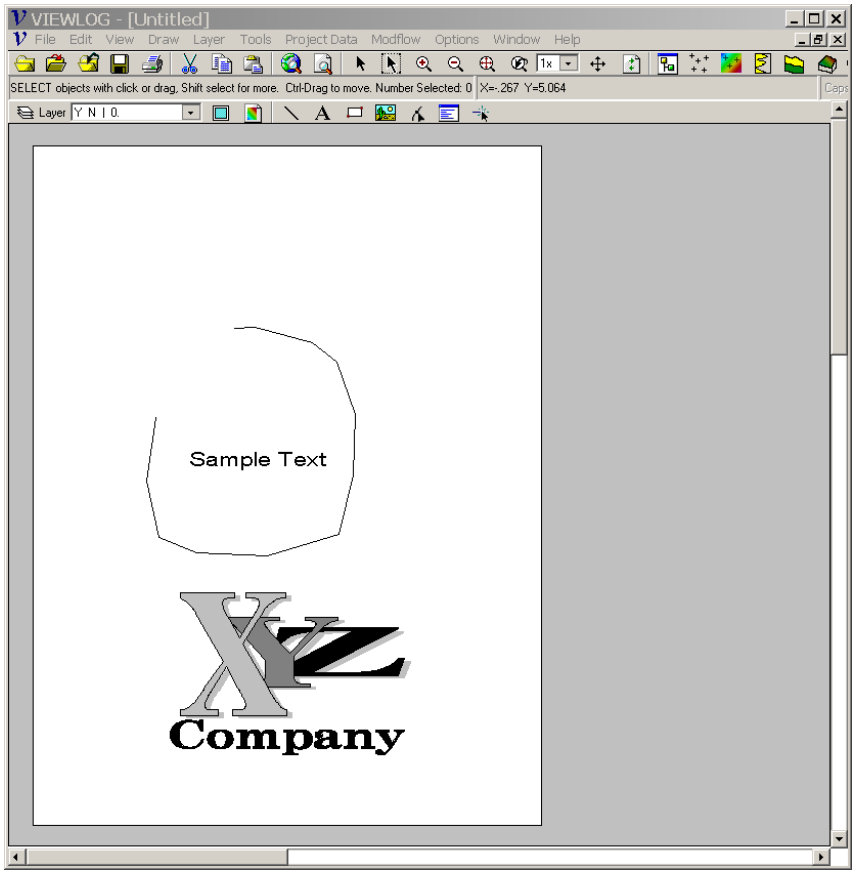
Linking Images

The ability to integrate image files greatly extends the capabilities of the Map Editor. Most popular formats are supported, including vector metafiles (WMF and EMF), bitmaps (BMP, JPG, GIF, TIF), and even other VIEWLOG files (MAP extension).

TASK: Insert a metafile.

PROCEDURE:

1. Select **Draw/**Place Image.
2. Click the left mouse button and drag the mouse to define a box in which the metafile will appear.
3. On release of the mouse button the **File Open** window will appear. Select C:\VL Tutorial\GeoModelTutorial\Company.WMF
4. When the screen redraws, the metafile will be drawn within the box, as shown below.


VIEWLOG - [Untitled]
File Edit View Draw Layer Tools Project Data Modflow Options Window Help
SELECT objects with click or drag, Shift select for more. Ctrl-Drag to move. Number Selected: 0
X=.267 Y=5.064
Sample Text
Company

Linking a WMF File.

Note: To select an embedded image, click the icon and click on one corner. For text, click on the lower left corner of the text box. Selected images can be stretched, shifted and transformed. The exact coordinates and attributes of the linked image can be edited using the **Edit/**Embedded Image attributes command.

Importing a File into a Map

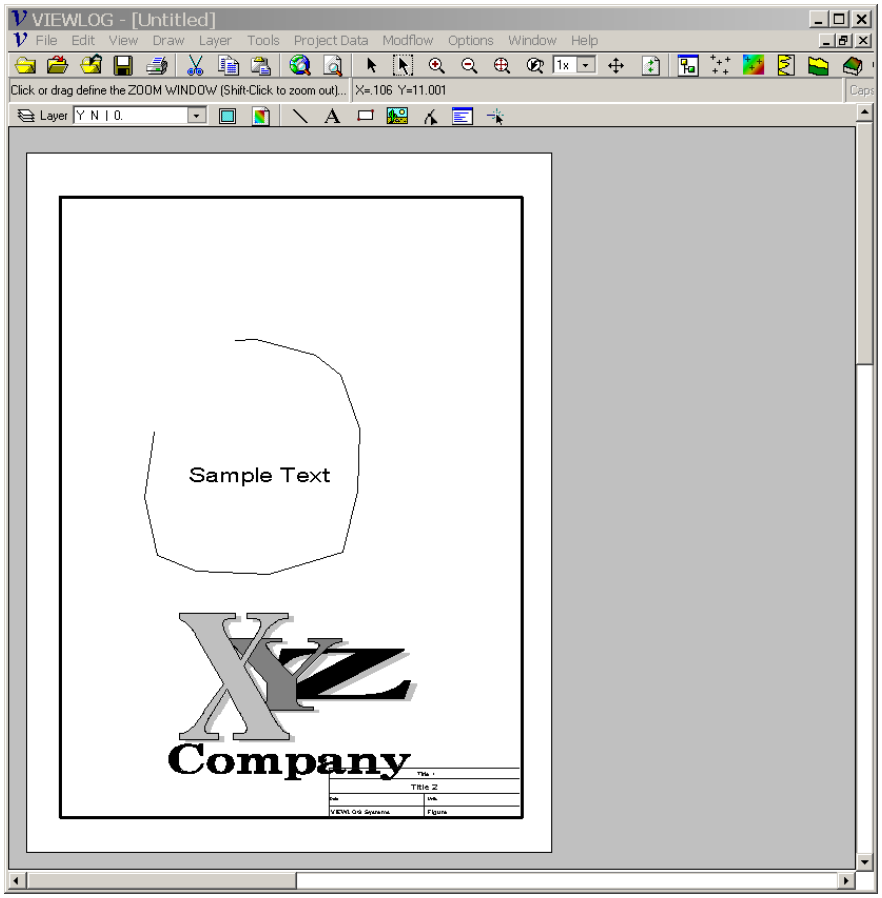
Other file types, such as SHP, DXF and existing VIEWLOG MAP files can also be imported. Importing a file is different than linking an image file. Importing allows the objects to be merged with existing objects, whereas linking only presents an "image" of the external map file.

TASK: Import an existing VIEWLOG map file.

PROCEDURE:

1. Select **File/**Import/merge, choose the appropriate file type, and select C:\Program Files\VIEWLOG3\Borders\Border85.MAP
2. When the screen redraws, you should see border around your figure, as shown below.

Note: On import, drawing layers and structure of the import file are preserved. Imported objects are all "selected" on import, allowing the attributes to be modified, if necessary.


VIEWLOG - [Untitled]
File Edit View Draw Layer Tools Project Data Modflow Options Window Help
Click or drag define the ZOOM WINDOW (Shift-Click to zoom out)...
X=.106 Y=11.001
Layer
Sample Text
Company
Title 2

Importing an Existing MAP File.

Note: Imported GIS files are placed on World coordinate Layers; DXF files can be placed on either Page or World layers.

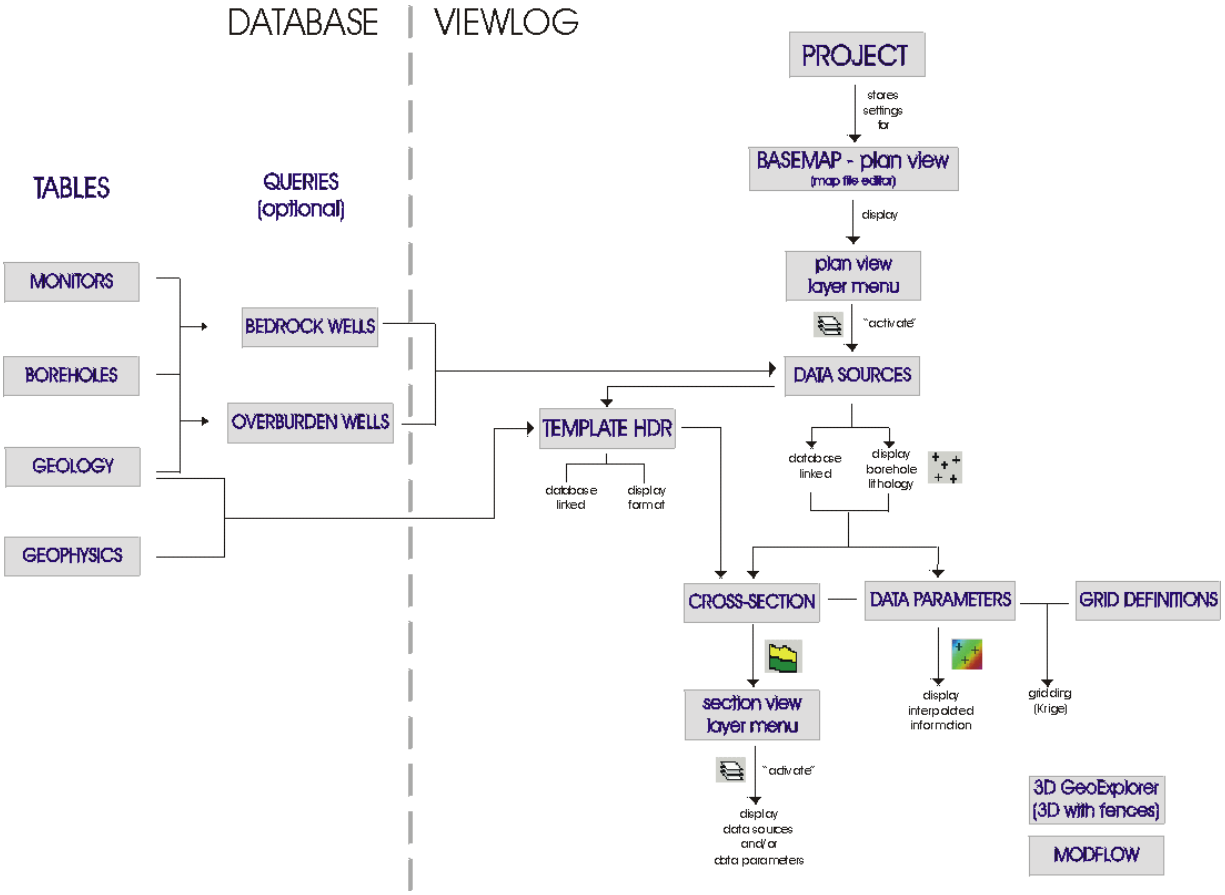
Lesson 2: Creating a New Project and Base Map using Mapping and GIS Functions

The Map Editor provides advanced functions for mapping, GIS analysis, cross sections and 3-D editing. This chapter introduces the main features of the Map Editor using South Florida as an example project. One of the first processes in creating a new project is to generate a basemap.

Project Management

While the database provides centralized field data storage, a corresponding system is required to manage the information on multiple maps and cross-sections that make up the interpretation of the data. VIEWLOG Project files provide the key linkage between the database, the geologic interpretation, and the numerous maps and cross-sections. Most importantly, Project file objects are used to link the following:

- Raw data stored in the database
- Display appearance for plan, section and 3-D views
- Interpretation and interpolation results, and
- Processing and analysis functions



Setting up a Project

Creating a Project file will allow links with the database and common elements of the geologic model to be stored. Objects in the Project file can be viewed in multiple maps and cross sections at the same time. While multiple maps can be open at the same time, only one project can be open in VIEWLOG at one time.

TASK: Create a VIEWLOG project.

PROCEDURE:

1. Make sure that the C:\VL Tutorial\GeoModelTutorial\Basemap.map that you created in the previous tutorial is still open and that you are in Page View.
2. Select **File/Project…/**New Project, and save the new project as C:\VL Tutorial\ GeoModelTutorial\GeoModel.prj.
3. Click **OK** to create the project file.

Generating a Base Map

Basemaps are constructed to provide a spatial reference point for the display of the well information. This can be accomplished in a number of different methods; importing/linking shape files or importing a DTM. The following tasks will outline both methods.

Using the Layer Menu

The **Layer** menu item in the Map Editor allows multiple layers to be defined within a drawing, in a similar manner to CAD programs such as AutoCAD. Layers provide a powerful method to group and manage drawing objects; for example objects from different shape files. The shape files that we will use for this project are as follows:

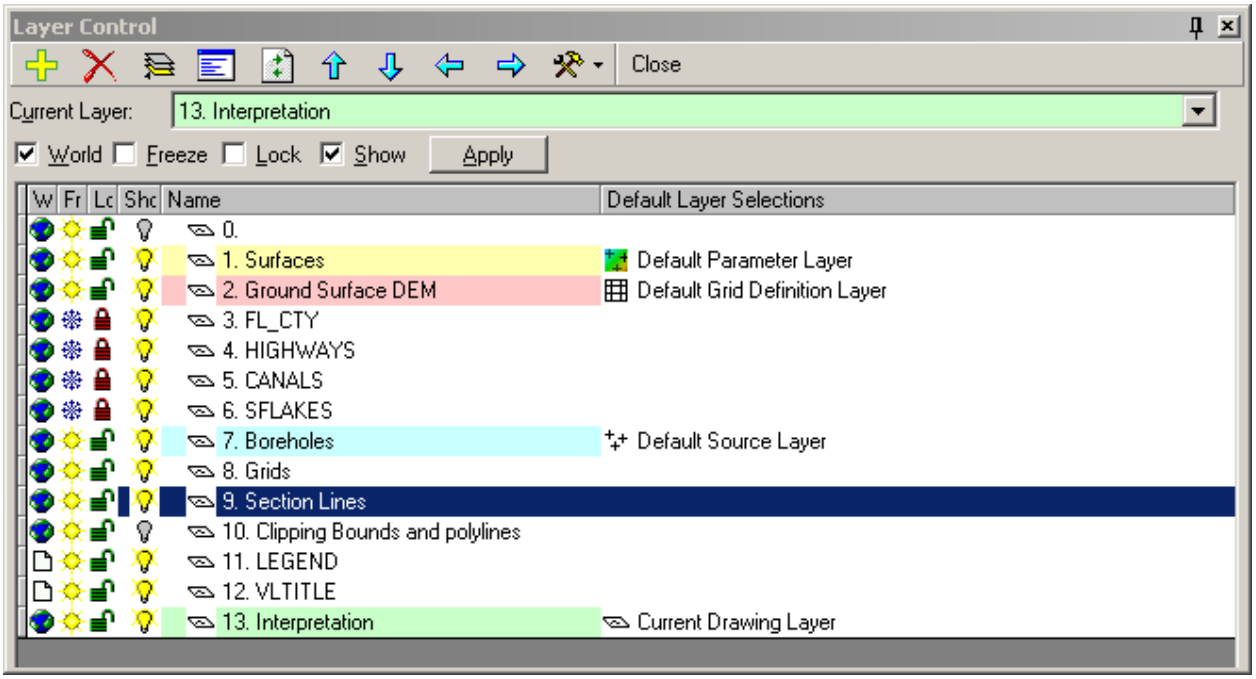
FL_CTY: The City outlines for the state of Florida.

HIGHWAYS: The Highways for the state of Florida.

CANALS: The Canal System for southern Florida.

SFLAKES: The Lakes in the state of Florida.

> **Note**: Each of these shape files will be imported as a separate layer.



The Layer Menu.

> **Note**: The order in which the layers are managed is also very important. Layer number 1, in the example above, is displayed as the lowest layer (i.e., drawn first) with the subsequent layers displayed on top.

Importing Shape Files

In order to create a base map, it is often necessary to import GIS-based shape files into a VIEWLOG project.

TASK: Import a shape file into a drawing.

PROCEDURE:

1. Open VIEWLOG, and select **File/**New drawing.
2. To import the shape file, select **File/**Import/merge, and then select the file C:\ \VL Tutorial\GeoModelTutorial\Shape Files\fl_cty.shp. A window entitled **Attribute Copy** will appear. Click **OK** to accept the defaults.
3. Repeat this procedure to import the Sflakes.shp shape file.

> **Note:** A new VIEWLOG Layer will be created for each shape file that is imported. You can view layers by clicking on the **Layer** menu item.

4. At this time, it is a good idea to save your map file. Select **File/**Save As, and save the map as C:\VL Tutorial\GeoModelTutorial\Basemap.map.

Linking to Shape Files

In the previous task, you imported two shape files into the project. When shape files are imported in this way, the objects become part of the VIEWLOG map file. However, some projects include many large shape files, which can result in very large VIEWLOG map files that can take considerable time to load and save. To avoid this problem, VIEWLOG also allows the user to link to shape files (or VIEWLOG Map files), so the contents of the file can be displayed in the Map Editor, but the actual contents of the file are not loaded into the current VIEWLOG map. This is known as linking to a shape file.

TASK: Link to a shape file.

PROCEDURE:

1. In VIEWLOG, load the Basemap.map file that you saved in the previous task.
2. Make sure you are in World coordinates by unchecking the **View/**Page View menu item.

> **Note:** World coordinates can also be activated by selecting the icon.

3. Open the Layer menu by selecting **Layer**.
4. Create a new layer by first highlighting the existing SFLAKES layer, and then right-clicking the mouse and selecting **Add**. The new layer will appear above the SFLAKES layer, and you can enter a name for this layer by left-clicking on the highlighted blank line (the line will be dark blue).

> **Note:** You can also add a new layer by clicking on the icon.

5. Enter CANALS for the layer name, and hit **Enter**.
6. Highlight the CANALS layer, right-click on the mouse and select **Properties**.
7. In the Layer Properties window, in the Linked GIS Coverage/Map File box, browse to C:\VL Tutorial\GeoModelTutorial\Shape Files\Canals.shp
8. Click **OK**, and then click **Apply**.
9. Repeat the procedure by creating a new layer called HIGHWAYS, and linking to the highways.shp file in the same directory.
10. You should now have four new layers in your Layer menu (the order may be different):
    a. FL_CTY
    b. SFLAKES
    c. CANALS
    d. HIGHWAYS

> **Note:** These layers can be switched on and off by double-clicking the icon to the left of each respective layer.

Editing the Color of Imported Map Objects

In the previous tutorials, we imported and linked to four different shape files. You should notice that there are many black lines on the map, and as a result, it is very difficult to distinguish between lakes, canals and highways. To "clean up" the map, we will change the color of the lakes to light blue, the canals to dark blue, and the highways to gray.

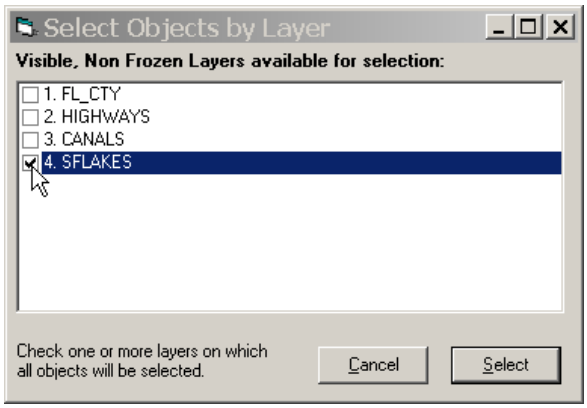
In this tutorial, we will change the attributes of shape files that have been imported in previous exercises.

TASK: Edit the color of map objects from an imported shape file.

PROCEDURE:

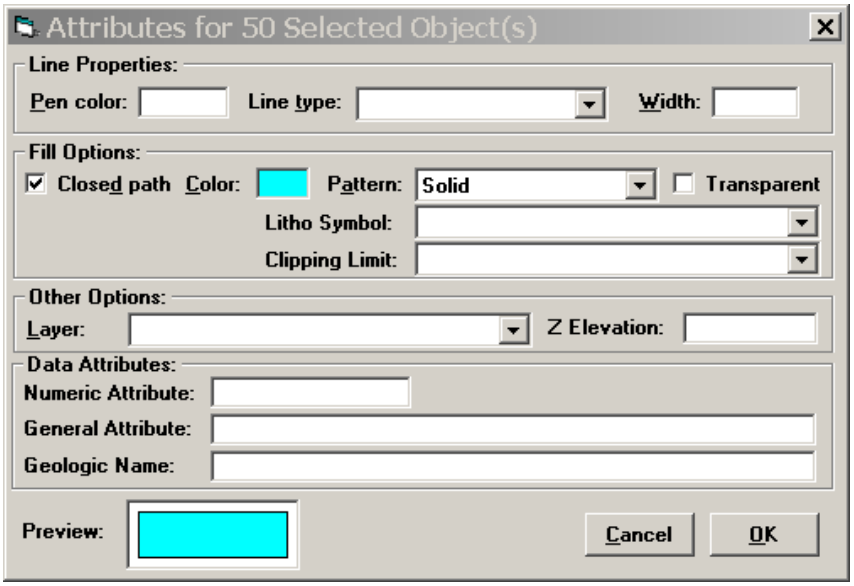
1. First, select all items in the SFLAKES layer. To do this, select **Edit/Advanced Select/**Select Layer.
2. Place a check beside the SFLAKES layer to select all items in this layer, as shown below:

Note: Only visible, non-frozen layers will appear in the list.



Selecting Objects by Layer.

3. Click on Select. You should notice that VIEWLOG has selected numerous objects.
4. Within the outermost box that encompasses the selected items, right-click and select Display Properties.
5. From this window, make the following changes in the Fill Options section of the Attributes window, as shown in the figure below:
   a. Click on Closed Path.
   b. Set the Pattern to Solid.
   c. Choose light blue for the color by clicking on the Color box.
   d. Click OK.



Changing the Color of Polylines.

6. Repeat this procedure for the FL_CTY layer. In the **Line Properties** box of the **Attributes** window, set the **Pen color** to grey, and leave the **Closed path** option unchecked in **Fill Options** section.

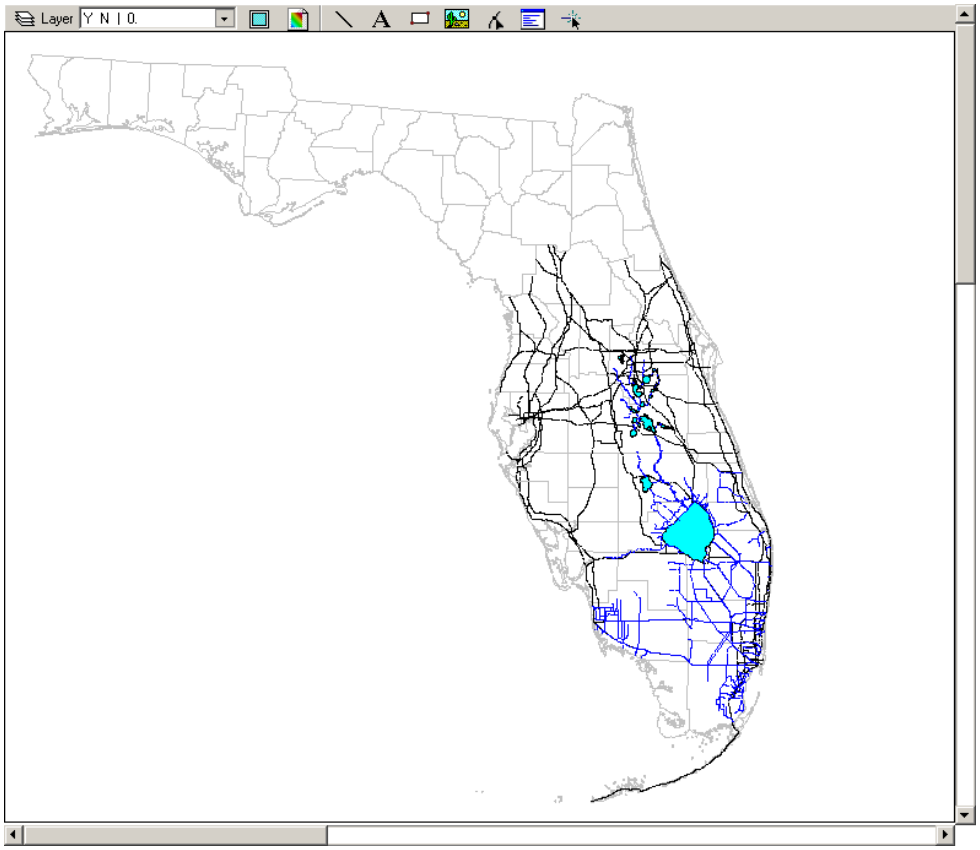
Editing the Color of Linked Layers

In this tutorial, we will edit the color of objects within a layer that contains a linked shape file.

TASK: Change the properties of objects in a linked shape file.

PROCEDURE:

1. Open the Layer menu by selecting **Layer**.
2. Select the CANALS layer, right-click and select **Properties**.
3. Select the **Legend/Display Properties** tab.
4. Change the **Legend Type** to: **Uniform Display Properties**.
5. In the **Line Properties** box, change the **Pen color** to Dark Blue, and the **Line type** to **Solid**.
6. Click **Apply**, then **OK**.
7. In the **Layer** window, click on **Apply**.



The Updated Map.

8. At this time, it is a good idea to save your map file. Select **File/**Save As, and save the map as C:\VL Tutorial\GeoModelTutorial\Basemap.map.

Showing and Freezing Layers

This tutorial outlines how to change a Layer from visible to invisible and frozen to unfrozen. For more information on the Layer menu, please see Layer Menu.

TASK: Examine some features of the Layer menu.

PROCEDURE:

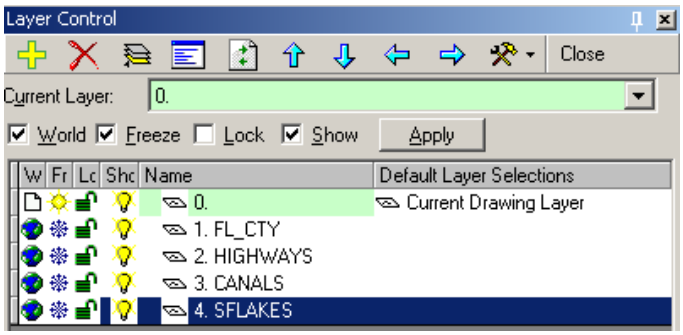
1. Open the Layer menu by selecting **Layer** from the main menu

> **Note:** The Layer menu can also be activated by clicking on the Layer icon.

2. Freeze the CANALS, HIGHWAYS, FL_CTY and SFLAKES layers by double-clicking the icon. Once a layer is frozen, you will see a icon.
3. Layers can be switched between invisible and visible mode by double clicking the and icons, respectively (see below).

> **Note:** Each layer is also defined as either a Page or World layer. Map objects, such as boreholes, should be on World layers; Figure objects, such as scales,

legends and borders, should be on Page layers. Double-clicking the , and icons will switch between the two layer types.



The Layer Menu.

Setting the Page Size

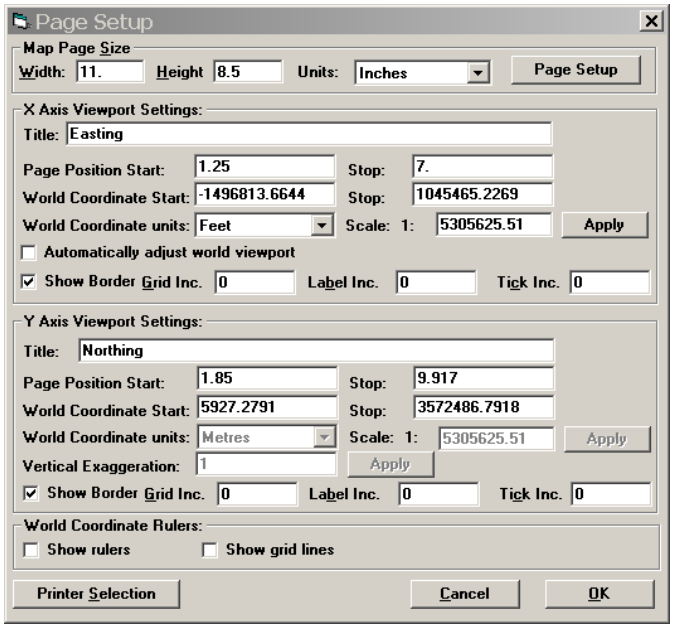
TASK: Set the page size to a 8.5 x 11 inch sheet of paper, with a landscape orientation.

PROCEDURE:

1. Select **View/**Page View to switch to Page coordinates.

Note: Page coordinates can also be activated by clicking on the icon.

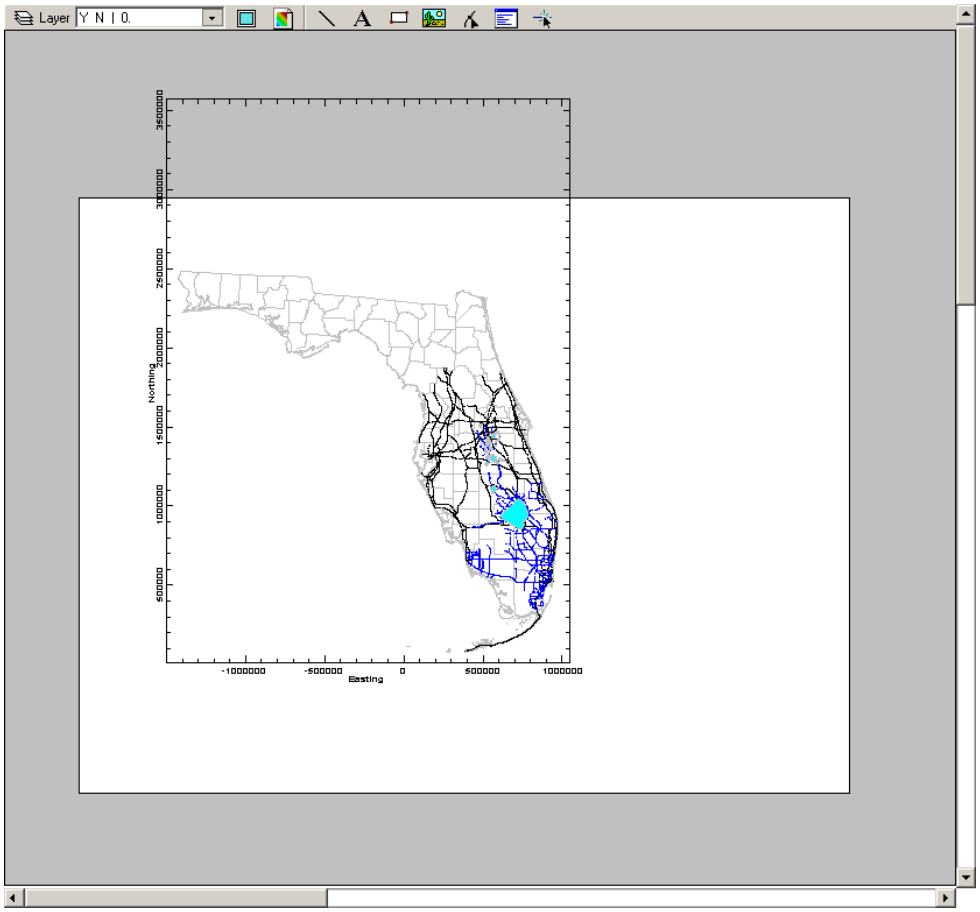
2. Select **View/**Map Scale Setup. You should see the following window appear as shown below:



The Page Setup Window.

3. In this window, set the **Width** to 11 inches and the **Height** to 8.5 inches.

4. In the **X-Axis Viewport Settings**, you should change the **World Coordinate units** to Feet.
5. Click on **OK**. You should see a figure that resembles that shown below:



Setting Viewports in Page Coordinates.

6. The white background represents the page. Anything outside of the white is off the page. To correct this figure, we will define a new viewport in the following section.

Defining the Viewport

A viewport is used to display a portion of the World coordinate system within a page. Two parts of the viewport are defined: one in World coordinates and one in Page coordinates. The World viewport defines the portion of the map or section that will be displayed. The Page viewport defines the position where the map or cross section will appear on the page. All objects in World coordinates outside of the World viewport are hidden in Page View (the World viewport can be used to clip the map).

The viewports can be defined by either using **View/**Set Viewport or **View/**Auto Set Viewports.

TASK: Interactively define the viewport.

PROCEDURE:

1. In World View, make sure that the imported shape files from the previous task are in World coordinates.

> **Note:** To check if a layer is in Page or World coordinates, open the Layer menu by selecting **Layer**. Page layers are denoted by the icon, whereas World layers are denoted by the icon.

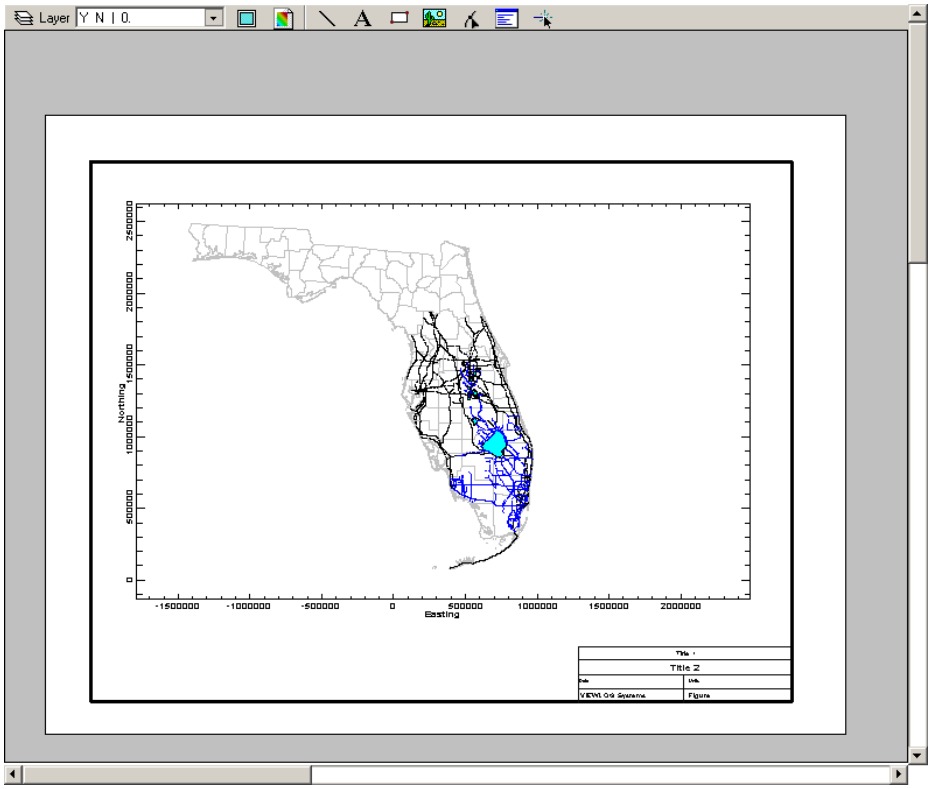
2. Select **View/**Set Viewport and click and drag to redefine the box around the entire drawing object, and make sure that all the objects are within the viewport box.
3. Select **View/**Page View to switch to Page coordinates (i.e., place a check beside **View/**Page View or click on the icon).
4. Select **File/**Import/merge to import the border. Select the file C:\Program Files\ VIEWLOG3\Borders\border11.map. Zoom out to view the entire page.

> **Note:** You can use either **F5** or the icon to zoom out.

5. Define the Page Viewport. Select **View/**Set Viewport. Click and hold the left button on the map to adjust appropriately within the map border.

> **Note:** After setting the Page Viewport, you may need to go back to World coordinates to reset the World Viewport to fit the map into the Page Viewport.

6. Select **File/**Save As, and save the file as C:\VL Tutorial\GeoModelTutorial \Basemap.map.



Page View Map showing World Coordinate Objects.

> **Note:** The Title box can be edited by zooming in on the bottom right-hand corner. Select the icon and click on first text character that should be edited.

7. At this time, it is a good idea to experiment with both the Page and World Viewports. Set new viewports in both Page and World coordinates by selecting **View/**Set Viewport and drawing a new box to define the viewports. As you change the viewports, flip between Page and World coordinates to examine the effects of changing the viewports. This will help you to learn about the viewports in more detail.
8. To automatically define the viewport, begin by setting the page dimensions in the **View/**Auto Set Viewports commands. Then choose the Page and World Viewports appropriate for the specific map data.

> **Note:** The exact position and dimensions of the page and world viewports can be set in the **View/**Map Scale Setup window. To set the position of the Page viewport, edit the **Page Position Start** and **Stop** values for the X and Y axis. To define the exact map scale, choose the World coordinate units, enter the **Map Scale** (e.g., 50,000) and click on **Apply**. This will reset the **World Coordinate Stop** value to a value appropriate for the selected map scale.

> **Note:** You might find it easier to define the viewport in Page View first. This allows you to control the size and shape of your map on your page. Once you are satisfied with this, flip to World coordinates and set the viewport. You will find that the shape of your viewport in World coordinates is restricted by the aspect ratio of the viewport you have set in Page coordinates. You can resize the viewport, but you will not be able to change the aspect ratio (i.e., the ratio of the width to the height of the viewport box), because the viewport you are specifying in World coordinates must fit in the window you have already set in Page coordinates.

Creating a Map View

Map Views can be used to save map configurations for later use. Typically, a new Map View is used for each new report figure. Map Views store information, such as which layers, Data Sources and Data Parameters are switched on, and the size and dimensions of both viewports. See Map View Menu for more details.

TASK: Create Map Views.

PROCEDURE:

1. Make sure you are in Page View by placing a check beside **View/**Page View (or by clicking on the icon).
2. Select **View/**Map View Menu. A **Map Views** window will appear.
3. In this **Map Views** window, add a new map view by selecting the icon.
4. Call this Map View Figure 1: Site Plan. You have now created a map view with this title. If you make changes to your viewports, or if you turn on or off different layers, you can always return to this map configuration by clicking on this map view.
5. To examine the Map View functions more closely, create a second Map View.
6. Change the Viewport in both Page and World coordinates. To do this, use **View/**Set Viewport in both World and Page coordinates.
7. Create viewports that are distinctly different from that in the previous section. Once you have done this, click on the icon in the **Map Views** window, and enter a new name for the new Map View.
8. You will now be able to flip back and forth between the two Map Views you've created by simply double-clicking on each Map View on the list. As mentioned above, Map Views also store which layers, Data Sources and Data Parameters are active.

Creating Map Text Fields and Automatic Titles and Legends

VIEWLOG map text objects can contain keywords that invoke powerful internal variables and advanced display properties. These include, for example, a keyword that automatically generates a map legend that dynamically adjusts depending on what map features are visible (see Text Attributes).

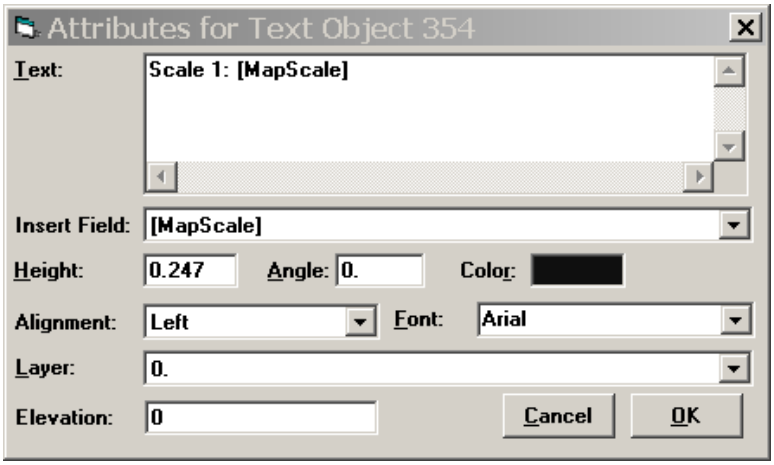
Map Text Fields are keywords, enclosed in square brackets and inserted in a text object. VIEWLOG has a number of text fields built into the **Text Attributes** window.

TASK: Insert a map Text Field.

PROCEDURE:

1. Make sure you are in Page View (i.e., ensure that **View/**Page View is checked).
2. Select the **Draw/*Text*** command, and click to define the text location. The **Attributes** window will be displayed, as shown below.
3. Click on the **Insert Field** list box, and choose the [ActiveMapViewName] item. This will insert the selected field name into the text box (in this case, the Map View name "Figure 1: Site Plan" should appear).
4. Adjust the text height and other options as necessary.
5. Click **OK** to exit the menu. When the screen redraws, VIEWLOG will substitute the current Map View name where this text object appears.
6. To add the map scale, repeat the above, except type into the text box the word "Scale 1:" and insert field [MapScale], as shown below. This will draw the actual map scale on the figure. As modifications are made to the viewports, this map scale will update automatically.

Note: You can combine regular text with the **Insert Fields**.



Automatic Map Scales.

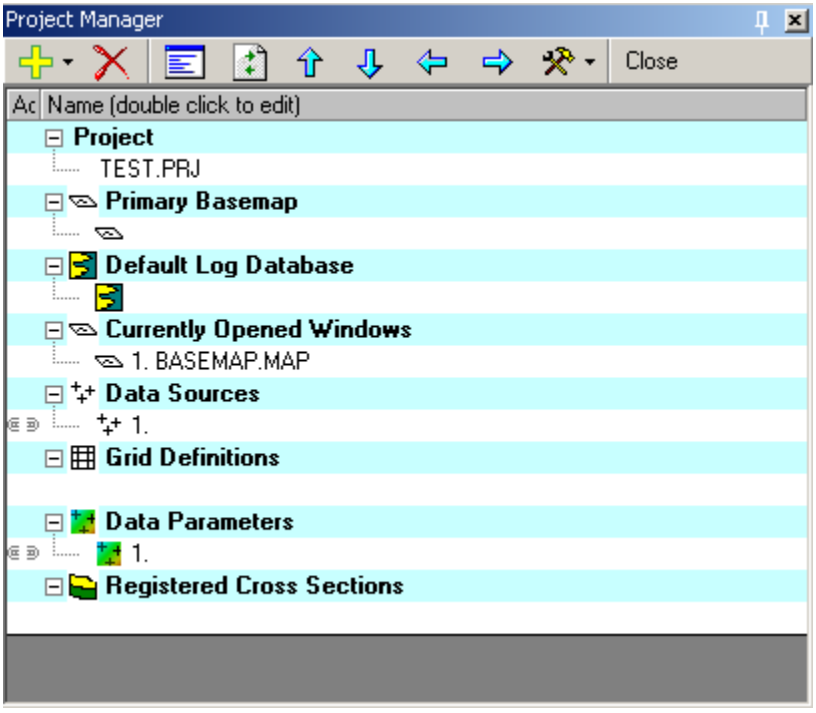
Registering the Base Map

It is important to remember to register your base map(s) and Cross Sections (in subsequent tutorials) in the Project Manager.

TASK: Register the base map.

PROCEDURE:

1. Make sure that the C:\VL Tutorial\GeoModelTutorial\Basemap.map that you created in the previous tutorial is still open.
2. Select **Project Data/**Project Manager.

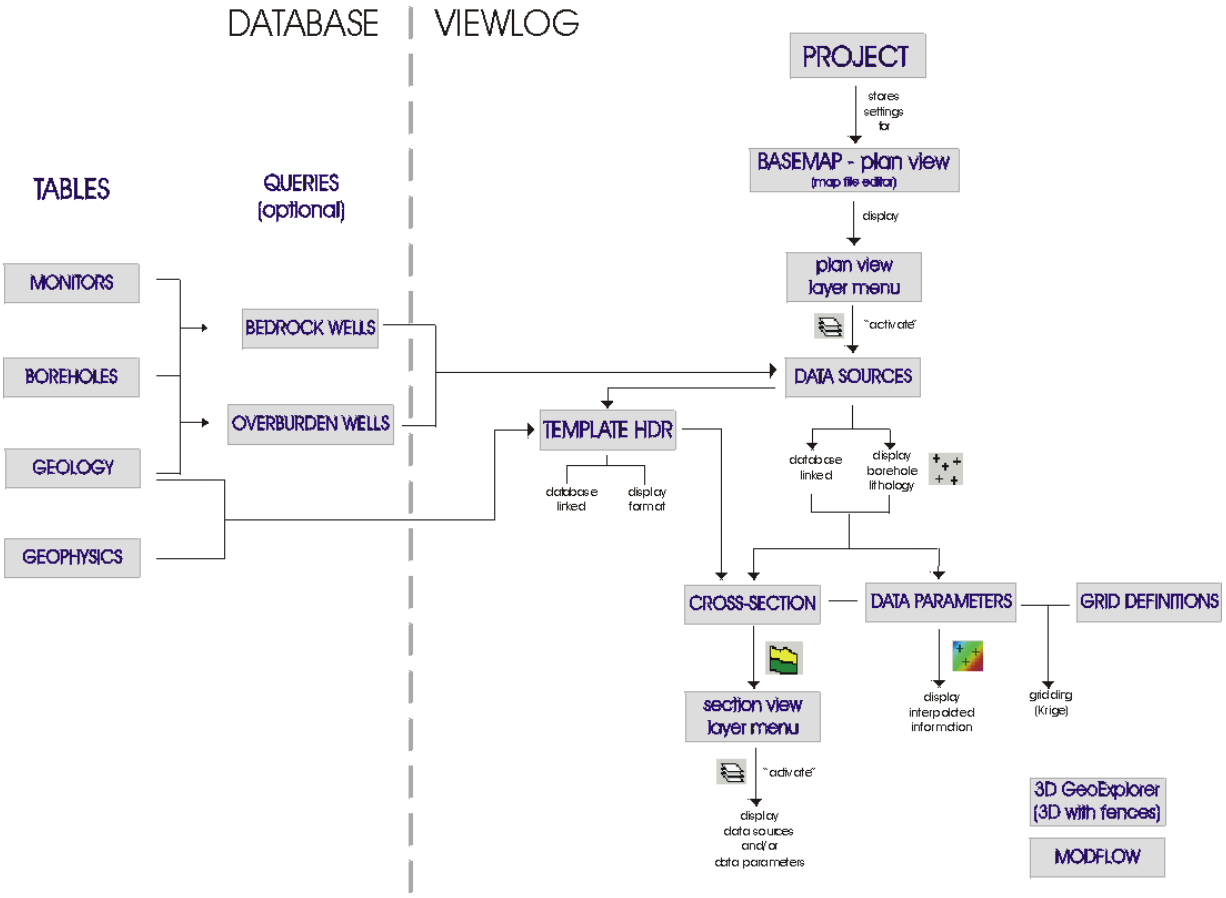


3. Select the icon and select **Define project base map**.
4. Select C:\VL Tutorial\GeoModelTutorial\Basemap.map and click **Open**.
5. Save your project and base map by selecting **File/*Save***, and clicking on **OK** if you are asked if you wish to save the project file.

> **Note:** A Project file can be linked to multiple map and cross section files. Updating a Project file object will automatically update all linked maps and cross sections.

Lesson 3: Introduction to Geologic Database Management

In order to take full advantage of the features of VIEWLOG, an understanding of databases is an asset. Although VIEWLOG can connect to any database, this chapter provides an introduction to MS-ACCESS databases for VIEWLOG users.



Creating a Query in MS-ACCESS

Because the borehole locations and the borehole depths are stored in different tables, we need to create a database query that combines fields from each of these tables.

TASK: Create a simple query in MS-ACCESS.

PROCEDURE:

1. Open the C:\VL Tutorial\GeoTutorial\GeologicModellingTutorial.mdb in MS-ACCESS.

> **Note:** This database is in MS-ACCESS version 2000. If you require a different version of the database, please contact VIEWLOG systems.

2. Before we begin to create a query, we will examine the format of this database.

The database consists of nine tables, as outlined below:

D_BOREHOLE: Top and bottom elevations of each borehole

D_BOREHOLE_CODE_TYPE: Codes defining type of borehole

D_BOREHOLE_WIRELINE: Borehole geophysical data

D_BOREHOLE_SCREEN: Borehole screen information

D_FORMATON_PICKING: Table made for formation picking

D_GEOLOGY_AQUIFER: Top and bottom elevations for aquifers

D_GEOLOGY_FORMATION: Top and bottom elevations for formation names

D_GEOLOGY_FORMATION_AGE: Top and bottom elevations for formation age names

D_GEOLOGY_FORMATION_AGE_TYPE: Reference Codes for formation ages

D_GEOLOGY_FORMATION_TYPE: Reference codes for Formation type

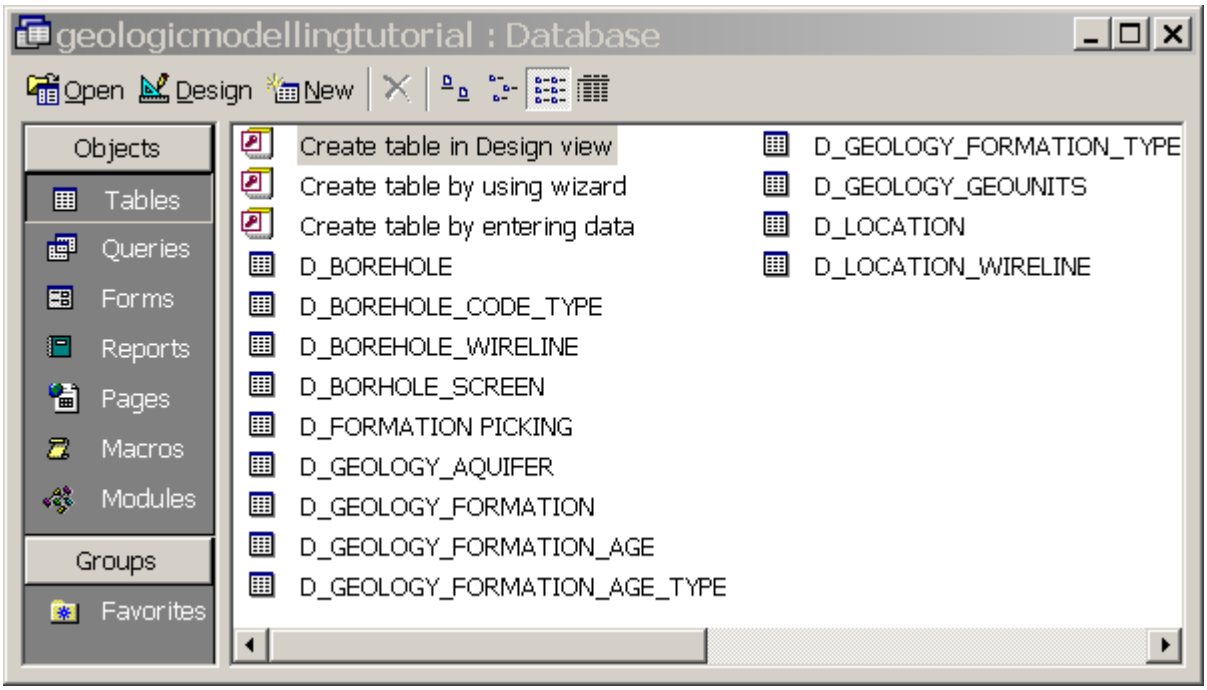
D_GEOLOGY_GEOUNITS: Top and bottom and geologic description

D_LOCATION: X and Y coordinate data.

D_LOCATION_WIRELINE: X and Y coordinate data for wireline data

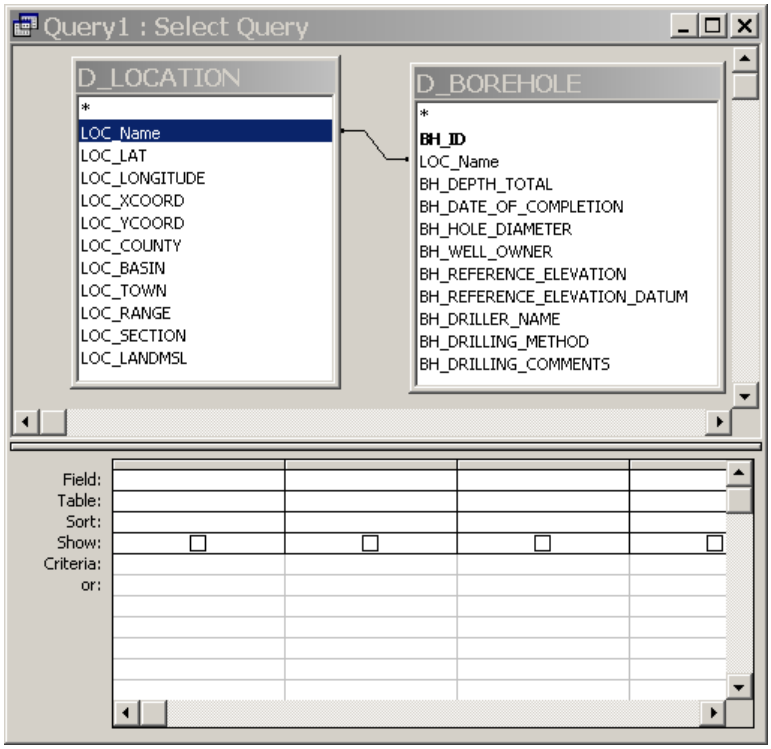
To view a description of the different fields within each of these tables, you can view each table in Design mode by clicking on the desired table, followed by the icon.

3. Create a new query by clicking on the **Queries** button and selecting **New**.



Creating a Query in MS-ACCESS.

4. Select Design View and click **OK**.
5. You will be prompted with a **Show Table** window. You can select which tables you want to include in this query. Double-click on D_LOCATION (for well locations) and D_BOREHOLE (for borehole depths) by double clicking on these tables. Close the **Show Table** window.



Design Mode for Creating a Query in MS-ACCESS.

6. Add the following tables to the query in this order (the order is important because it will make the use of this query much simpler when we connect VIEWLOG to this query):
   a. BH_ID (from D_LOCATION)
   b. LOC_NAME (from D_LOCATION)
   c. LOC_XCOORD (from D_LOCATION)
   d. LOC_YCOORD (from D_LOCATION)
   e. LOC_LANDMSL (from D_LOCATION)
   f. Bottom Elev:[D_LOCATION]![LOC_LANDMSL] - [D_BOREHOLE]![BH_DEPTH_TOTAL]

> **Note**: The bottom elevation has to be calculated to by subtracting the borehole total depth from ground surface. Type the above line into the Field Space provided in the next available column in the query.

   g. LOC_COUNTY(from D_LOCATION)
   h. LOC_BASIN (from D_LOCATION)

i. LOC_TOWN (from D_LOCATION)
j. LOC_RANGE (from D_LOCATION)
k. LOC_SECTION (from D_LOCATION)

7. Save the query as VL_All Wells. You can see what the query looks like by clicking on the icon.

> **Note:** The GeologicModellingTutorial.mdb database includes this query already, named VL_Well Master Location.

Filtering a Query in MS-ACCESS

For the VL_Well Master Location query we just created in the previous task, we will add some filters to exclude boreholes that do not have top or bottom elevations.

TASK: Filter a query in MS-ACCESS.

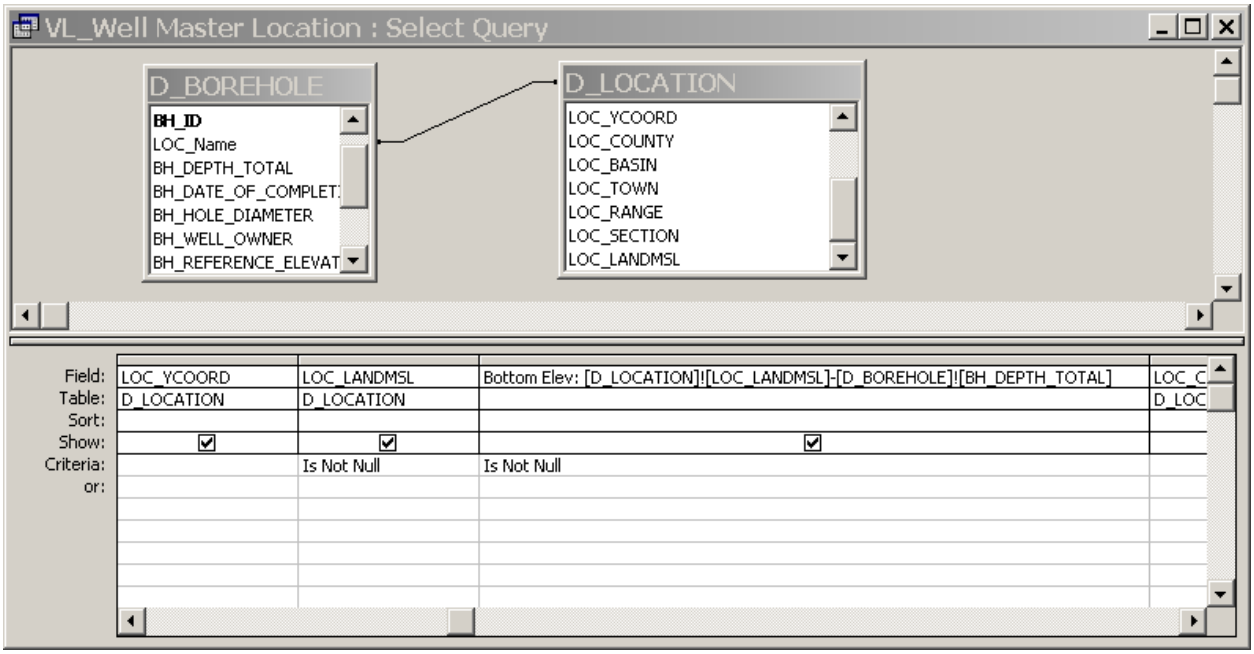
PROCEDURE:

1. Open the VL_Well Master Location query in Design View.

2. In the **Criteria** row, under LOC_LANDMSL and BOTTOM_ELEV, add “is not null”.

3. Run the query by selecting the icon. You should notice that there are fewer entries because we have filtered the data.

4. Save the query.



Filtering a Query in MS-ACCESS.

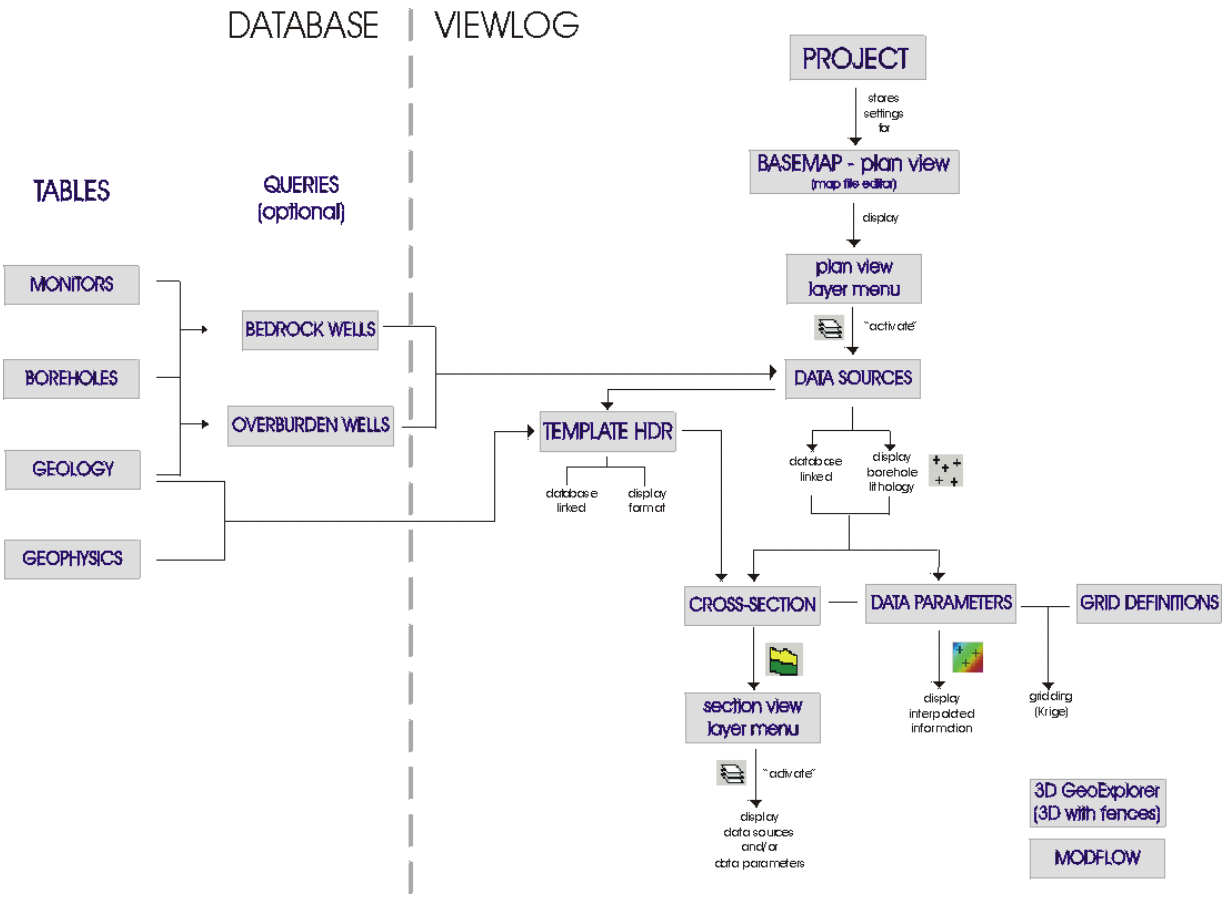
Lesson 4: Introduction to Data Sources

In this lesson, we will step through the process of creating a Data Source.

> **Note:** It is very important that you have completed the previous tutorials because the following tutorials are based on the base map and project links that you have already completed.

Data Sources contain information about a group or class of boreholes or monitoring intervals and provide a logical structure for organizing, displaying and processing these data. Groups can be defined on any basis and use a database table or query for selection. Data Sources bring together the database link, display options, geologic display and editing and some grid-based processing functions.

While Data Sources are frequently used to define a group of boreholes from one geologic formation, they are generally not used to classify measurements made in that formation. Data Parameters, which are outlined in Lesson 6: Working with Data Parameters, are used for that option.



The Data Source structure is very flexible, and because it contains a link to a database. As new boreholes are added to the database, they will automatically be added to the Data Source if they meet the conditions defined in the Data Source table or query.

Data Sources are used for:

- borehole location management and posting
- grouping of monitoring information
- linkage to HDR file for geologic information
- database linkage for on-section geologic unit picking
- writing gridded (interpolated) information back to fields in the database.

Creating a New Layer for a Data Source

Creating a new Data Source and linking it to the database is a basic and common task in VIEWLOG. Before we create the Data Source, we must create a new layer.

TASK: Create a new layer for a Data Source.

PROCEDURE:

1. Open the C:\VL Tutorial\GeoModelTutorial\Basemap.map in World view.

> **Note:** Remember that upon opening a map file the first time VIEWLOG will automatically open the map in Page coordinates (i.e., make sure the **View/**Page View is not checked).

2. Select **Layer** to open the Layer menu. Use the icon to create a new layer.
3. Name this layer "Boreholes" by clicking on the new, blank layer (the selected layer name will be dark blue when highlighted).
4. Your new Boreholes layer may be at the top of the list. To move it down, highlight the layer and hit the icon to move the Borehole layer down to layer number 5.
5. Make the Boreholes layer is the current layer by highlighting it and clicking on the icon (You can also make this layer the current layer by first selecting the layer, right-clicking, and selecting **Set to Current drawing layer**.)
6. Make sure that this new Boreholes layer is in World coordinates. To do this, check the left-most icon. If the icon is shown, double click this icon to change this layer to World coordinates. The icon will be changed to: .
7. Make the Boreholes layer the default source layer by right-clicking, and selecting **Set to default Source Layer**. This means that when new Data Sources are created, they will, by default, be assigned to this layer.
8. Close the Layer menu.
9. Select **Project Data/**Data Source (Shortcut: **F11**) to open the Data Source window; click **Yes** to create a new Data Source.

> **Note:** The Data Souce window can be opened several ways. With the keyboard, you can use either **Project Data/**Data Source or **F11**. With the mouse, you can click on the icon, or right-click and select **Data Source**.

Listing the Data Source

There are nine tabs associated with the Data Source menu. You will find that by following one tab at a time from left to right, each time you create a new Data Source, you will remember to fill in the appropriate information (see Data Source: List Tab.)

TASK: Complete the **List** tab in the Data Source menu.

PROCEDURE:

1. The **List** tab presents a list of all the Data Sources available in the current project. The check box beside each name indicates whether the source is "activated" within the current map. Currently, there should be no Data Sources listed. To activate the new Data Source, check the box beside the name, and then select a layer on which the source will be displayed in the current map.
2. From the **Activated on Layer** drop-down menu, select the layer we just created: Boreholes.

> **Note:** It is important to note that for a Data Source to be visible, it must be activated, the layer on which it is activated must be visible, and the display options (**Plan View** and **Section** tabs in the Data Source window) must be set appropriately.

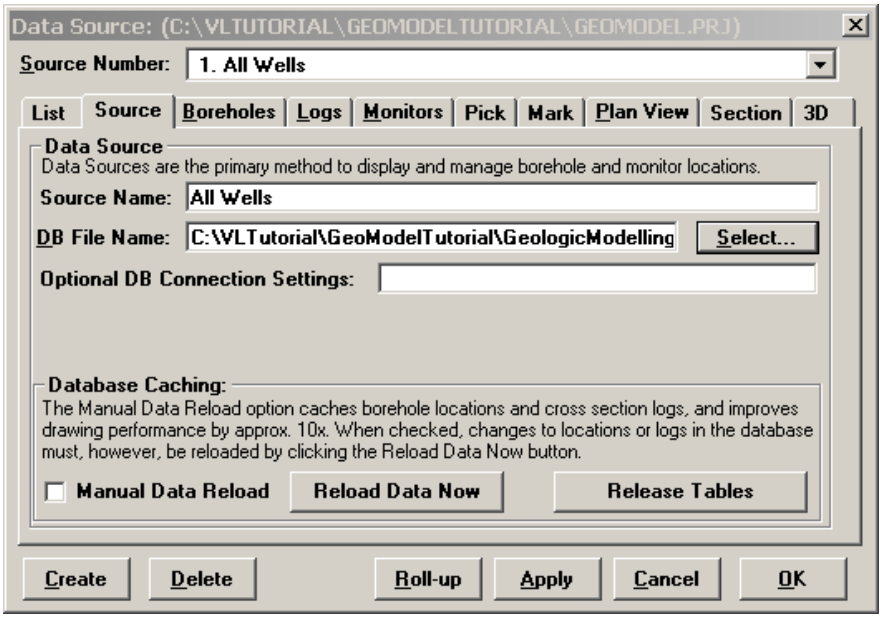
Database Connectivity for Data Sources

The **Source** tab defines the name of the Data Source and the basic database connection parameters (see Data Source: Source Tab).

TASK: Complete the **Source** tab in the Data Source menu.

PROCEDURE:

1. In the **Source Name** field, type All Wells.
2. To connect to an MS-ACCESS file, click the **Select…** button and choose the MDB file C:\VL Tutorial\GeoModelTutorial\GeologicModellingTutorial.mdb.



The Source Tab in the Data Source Window.

Entering Borehole Data for Data Sources

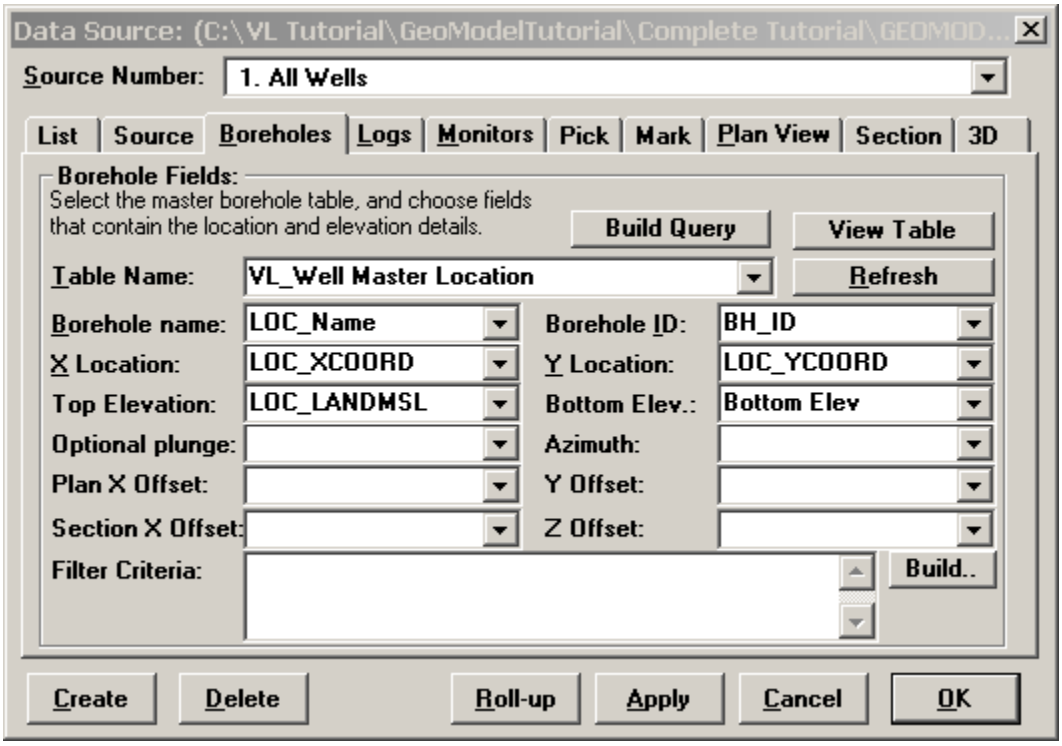
The database table and fields are selected in the **Boreholes** tab. To view borehole locations in plan view, the name, ID, and location fields should all be linked to database fields. For viewing boreholes in cross section, the elevation field must also be linked. All other fields are optional (see Data Source: Boreholes Tab).

TASK: Complete the **Boreholes** tab in the Data Source menu.

PROCEDURE:

1. For the **Table Name**, select the query called VL_Well Master Location from the drop-down menu. Click **Refresh** to link the menu to the table. This query has been set up such that the fields should be loaded automatically. Compare your VIEWLOG window with that shown below.

> **Note: Plunge** and **Azimuth** are used to define deviated boreholes. The offsets can be used to generate custom label offsets, for display purposes.



The Boreholes Tab in the Data Source Window.

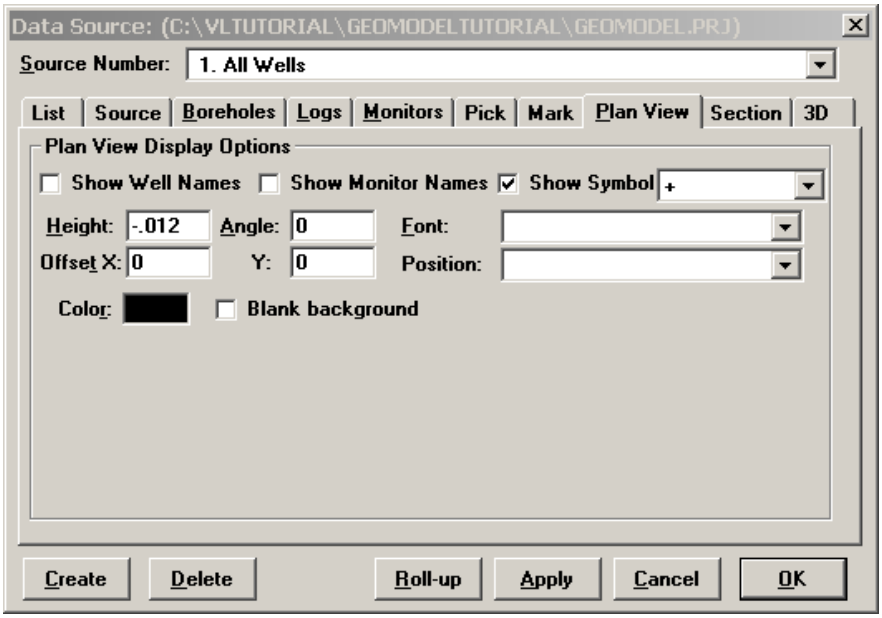
Modifying the Display of a Borehole Data Source in Plan View

In the Data Source window, the **Plan View** tab is used for formatting and display of the borehole information on plan-view maps (see Data Source: Plan View Tab).

TASK: Modify the display of boreholes in the **Plan View** tab.

PROCEDURE:

1. From the following figure, complete the table.



The Plan View Tab in the Data Source Window.

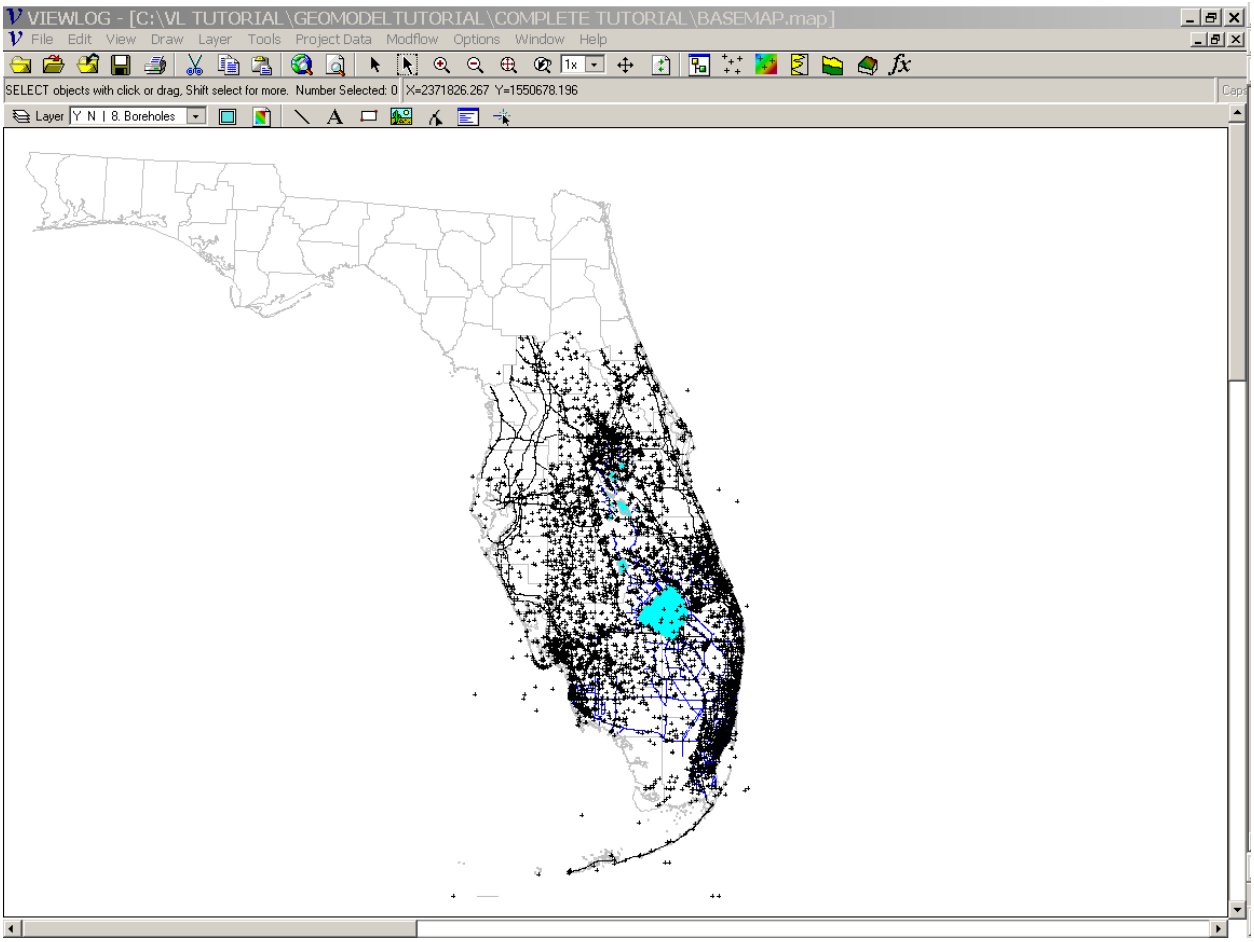
2. The height of the borehole symbols can be defined in two ways:

a. **Actual Height in World coordinates**: Enter the height and offset values in map units, such as metres or feet.

b. **Scaleable Height**: By entering a negative height value the size of the text and symbol can automatically scale with the size of the viewport. For example, enter a height of –0.01 to scale the label and symbol to 1% of the visible map area. As you zoom in and out, the symbols will remain the same size.

3. After completing all the tab information, click **Apply** and **OK** to close the Data Source window.

Note: The borehole locations should now appear on your base map. If they do not, open up the Data Source window again, go back to the **List** tab (see Data Source: List Tab) and make sure that the Data Source you just created (All Wells), has been activated (i.e., checked on).


VIEWLOG - [C:\VL TUTORIAL\GEOMODELTUTORIAL\COMPLETE TUTORIAL\BASEMAP.map]
File Edit View Draw Layer Tools Project Data Modflow Options Window Help
SELECT objects with click or drag, Shift select for more. Number Selected: 0
X=2371826.267 Y=1550678.196
Layer Y N I 8. Boreholes

Displaying all wells on basemap

Displaying Boreholes on Section

Header (HDR) files, which are created in the Log Editor, are used to control the presentation of borehole logs in cross section and preview modes. The **Logs** tab in the Data Source window allows the user to specify two different HDR files. The first – the **Default Template HDR File** – is used to present borehole logs on cross section. The second – the **Alternate Template HDR File** – is used to show borehole logs in plan view. If the second HDR file is left blank, logs will be shown in preview mode using the Default Template HDR (see Data Source: Logs Tab). For this lesson we will be using predefined templates. For more information on how to create a template HDR file please refer to Lesson 5 - Advanced Procedures using Data Sources

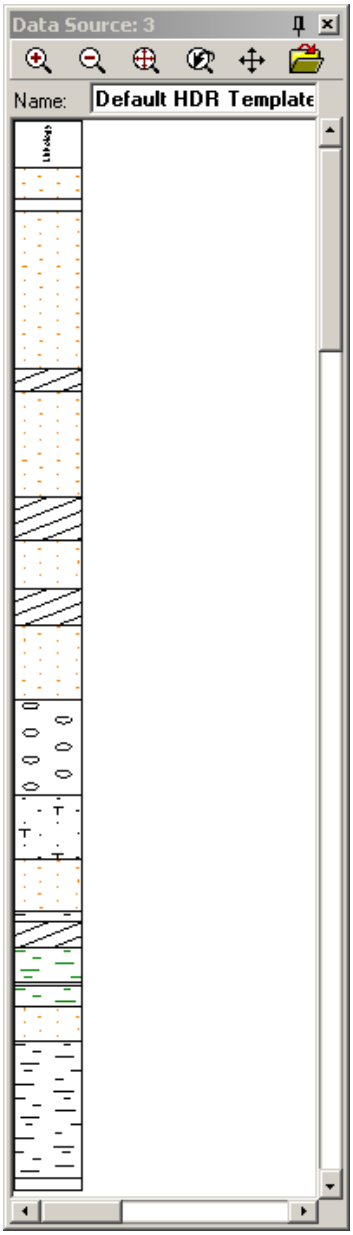
TASK: Displaying borehole information on section.

PROCEDURE:

1. In the **Logs** tab, click on the **Select** button for the Default Template HDR File. Choose C:\VL Tutorial\GeoModelTutorial\DEFAULT_TEMPLATE
2. Select **Preview** to view the log. The template HDR file has been formatted to display lithology, which will then appear on any cross section. Select **Options/**Lithology Symbols to specify a new lithology symbol library.

3. In the upper left-hand corner of the **Lithology Symbol Library** window, click on **File**, and select **Open Library**. You will be asked if you want to save your current library; select **No**.
4. Select the library C:\VL Tutorial\VL Tutorial.LSM and click **Open**.
5. Hit **OK** to close the **Lithology Symbol Library**. Your log should resemble that shown below.

Note: Your lithology column may be of different width than that shown in the following figure.



The Default Template HDR File showing Lithology.

> **Note:** In the **Logs** tab of the Data Source window, make sure that the **Template link field** is set to: Borehole ID number.

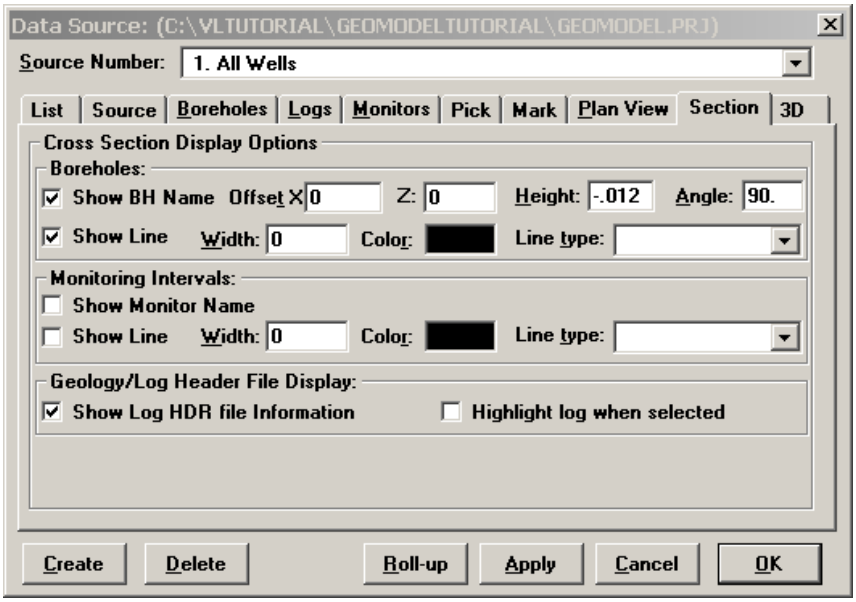
Modifying the Display of a Borehole Data Source on Cross Section

The **Section** tab controls the display of the well information on cross sections (see Data Source: Section Tab).

TASK: Modify the format of the display of boreholes in cross section in the **Section** tab.

PROCEDURE:

1. From the following figure, complete the table.



The Section Tab of the Data Source Window.

2. Height values are in World coordinates (e.g., metres or feet). Checking the **Show Line** option draws a vertical line at the borehole position on the section. Monitoring zones can be displayed by choosing the **Show Line** option in the **Monitor Intervals** section (in this tutorial, we do not have monitoring data). Making the monitor line thicker, and a different color, than the borehole line provides an effective way to display the monitoring interval.
3. Geologic information at each borehole is displayed by enabling the **Show Log HDR file Information** check box. (This will display the Default_Template.HDR, which we connected in the above exercise.)

Creating a Cross Section

Now that we have set up the All Well Data Source, we are ready to create a simple cross section.

TASK: Create a cross section.

PROCEDURE:

1. Open the base map in World coordinates.

2. Make sure that the Data Source that you just created, All Wells, is activated (i.e., on the **List** tab it is checked on).

3. Create a new layer called Section Lines. Open the Layer menu and hit the icon to create a new layer. Name this layer "Section Lines". Set this layer to the current layer by highlighting, right clicking and selecting **Set to Current drawing layer**.

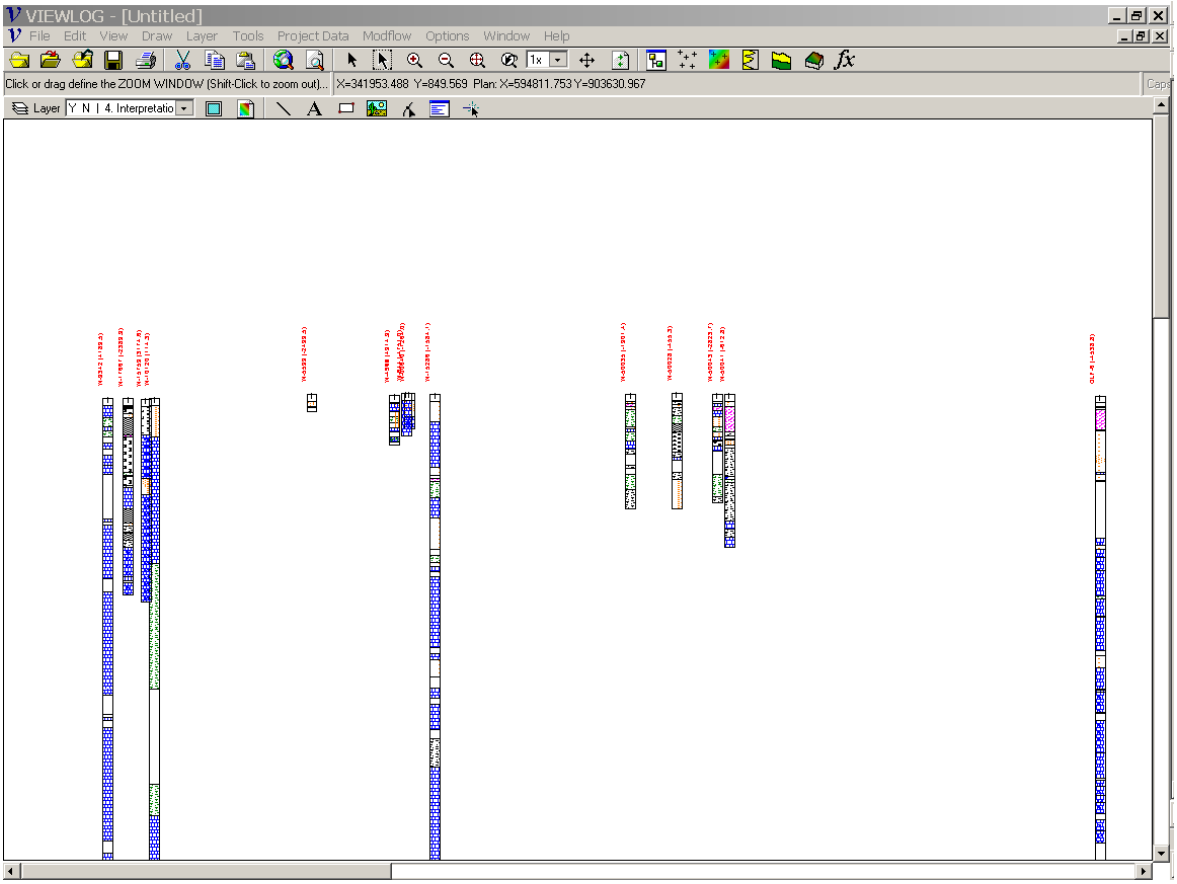
4. Select **Draw/**New Polyline and draw a polyline through the cluster of boreholes displayed on the map.

5. Select **View/**Create Cross Section (or use the icon) and answer **Yes** to create the cross section. A series of boreholes should appear on the screen as shown below. If no boreholes appear, select **View/**Cross Section Setup, and increase the **Borehole Offset Distance** (try 2500 or 5000).

> **Note:** When in plan view, **View/**Cross Section Setup is used to set default cross-section values for the current VIEWLOG project. In a cross section map, **View/**Cross Section Setup will set values for only the current cross section.

6. You may also want to change the vertical exaggeration. This can be done with **View/**Cross Section Setup. Try setting this to 25.

7. This cross section is a *.MAP file that can be saved for later use.


VIEWLOG - [Untitled]
File Edit View Draw Layer Tools Project Data Modflow Options Window Help
Click or drag define the ZOOM WINDOW (Shift-Click to zoom out)...
X=341953.488 Y=849.569 Plan: X=594811.753 Y=903630.967
Layer Y N I 4. Interpretatio

Cross Section Showing Default Template.HDR information

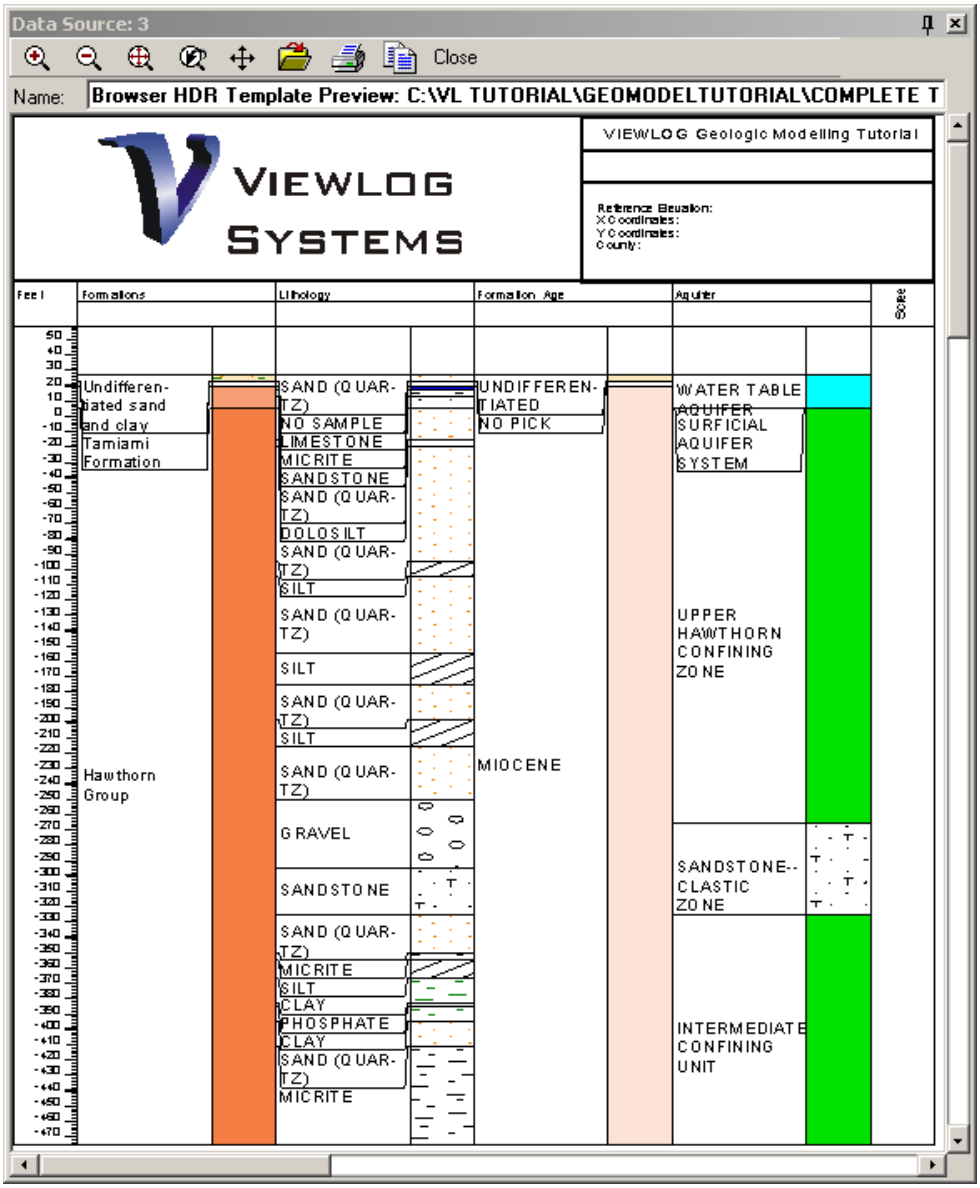
Displaying Boreholes in Plan View

Header (HDR) files, which are created in the Log Editor, are used to control the presentation of borehole logs in cross section and preview modes. The **Logs** tab in the Data Source window allows the user to specify two different HDR files. The first – the **Default Template HDR File** – is used to present borehole logs on cross section. The second – the **Alternate Template HDR File** – is used to show borehole logs in plan view. If the second HDR file is left blank, logs will be shown in preview mode using the Default Template HDR (see Data Source: Logs Tab). For this lesson we will be using predefined templates. For more information on how to create a template HDR file please refer to Lesson 5 - Advanced Procedures using Data Sources

TASK: Displaying borehole information in plan view.

PROCEDURE:

1. In the **Logs** tab, click on the **Select** button for the Default Template HDR File. Choose C:\VL Tutorial\GeoModelTutorial\ALTERNATE_TEMPLATE
2. Select **Preview** to view the log. The template HDR file has been formatted to display formation, lithology, formation age, Aquifer and Screen information.



Alternate_Template.HDR for viewing Log information in Plan View

3. Close the preview template pop up window and return to your basemap.
4. Choose **Tools/*Show Source Browser window***. Initially this window will appear blank.
5. Select a well on the basemap map, by using the select tool. If there is information on that well the data source browser window will update. If there is no information for a well, the Data Source browser window will not update. In the following section we will generate a new query to only display wells that contain information.

Lesson 5: Advanced Procedures using Data Sources

Filtering Data in Data Sources

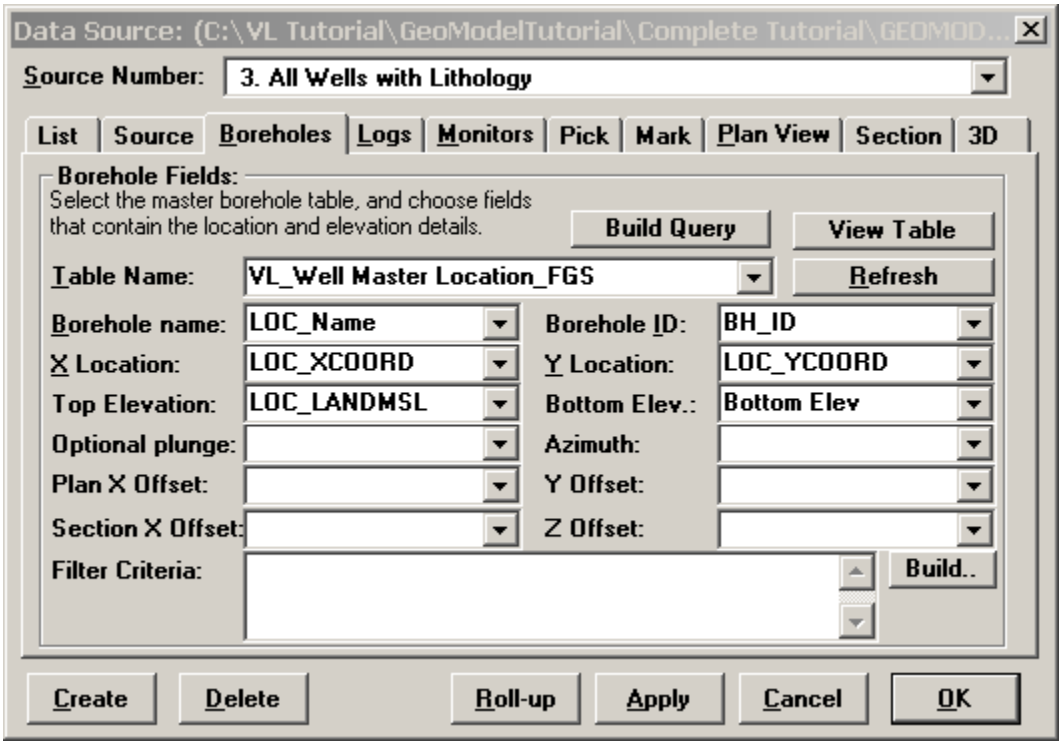
The database table and fields are selected in the **Boreholes** tab. To view borehole locations in plan view, the name, ID, and location fields should all be linked to database fields. For viewing boreholes in cross section, the elevation field must also be linked. All other fields are optional (see Data Source: Boreholes Tab).

TASK: Create a new Data Source.

PROCEDURE:

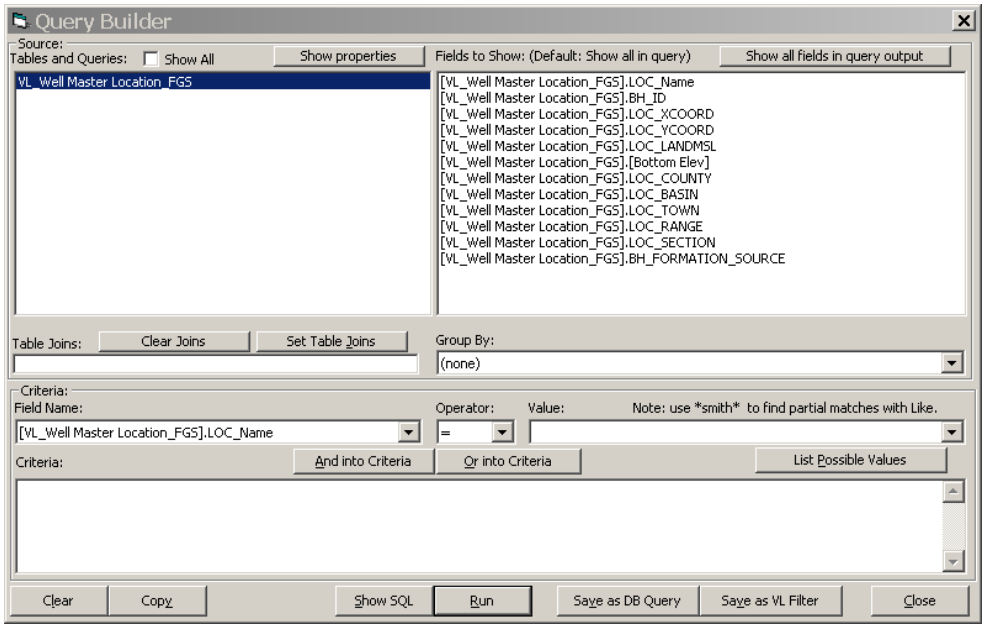
1. Open the **Data Source** menu, click on the **List** tab.
2. Choose **Create**. Do not replicate the setting and append the new data source to the end off the list.
3. On the **Source** tab, name the new Data Source “All wells with lithology” and select the DB file Name as C:\VL Tutorial\GeoModelTutorial\ geologicmodellingtutorial.mdb.
4. Click on the **Boreholes Tab**. For the **Table Name**, select the query called VL_Well Master Location_FGS from the drop down menu. Click **Refresh** to link the menu to the table. This query has been set up such that the fields should be loaded automatically. Compare your VIEWLOG window with that shown below.

> **Note: Plunge** and **Azimuth** are used to define deviated boreholes. The offsets can be used to generate custom label offsets, for display purposes.



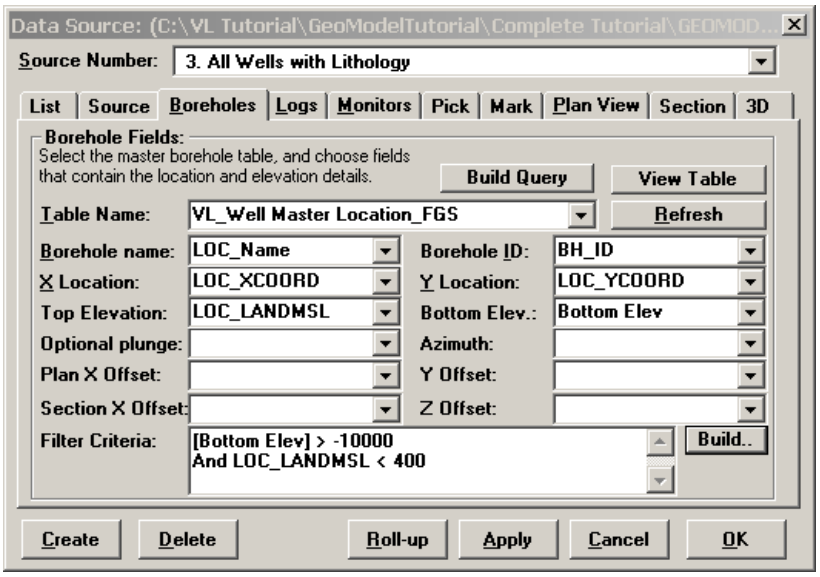
The Boreholes Tab in the Data Source Window.

5. We will use the **Filter Criteria** box to create a filter to exclude wells that are deeper than 10,000 feet and above 400 feet. Click on the **Build..** button. This will open the **Query Builder**, as shown below.



The VIEWLOG Query Builder.

6. The upper right of the window lists all of the fields from the table you have chosen. For our purposes, we want to write a query that will exclude wells with a bottom elevation below 10,000 feet. From the **Field Name**, select [VL_WellMaster Location_FGS].[BOTTOM_ELEV] from the pull-down menu and choose '>' as the **Operator**. In the **Value** box, type in –10000. Click on the **And into Criteria** button.
7. Repeat the process for wells with a ground surface elevation > 400 feet:
   a. **Field Name**: [VL_WellMaster Location_FGS].[LOC_LANDMSL]
   b. **Operator**: <
   c. **Value**: 400
   d. Click the **And into Criteria** button.
8. Click on the **Save as VL Filter** button.
9. Click on the **Close** button. In the **Borehole** tab within the Data Source window, you should see the filter criteria appear.



New Data Source displaying only boreholes with lithology information no deeper than –10000 feet and not elevation greater than 400 feet.

10. On the Log Tab choose DEFAULT_TEMPLATE.HDR for the **Default Template HDR** and choose ALTERNATE_TEMPLATE.HDR for the **Alternate Template HDR.**
11. On the **Plan View** tab, change the **Color** to red and the **Symbol** to filled box. Choose **Apply.**
12. The base map should now have red symbols displayed showing only the well with lithology information. If it does not return to the List tab and make sure that the new data source has been activated.
13. If you want to make a new cross section, make sure that the **Section** tab has the appropriate setting clicked on (**Show Line** and **Show Log HDR Information**)

Create a Data Source to Display only the Downhole Geophysical Data.

TASK: Create a third Data Source to display only the Downhole Geophysical information

PROCEDURE: Follow all the previous steps outlined in the above task.

1. Create a new data source from the **List** tab.
2. Name the new Data Source: All Wells With Wireline
3. On the **Boreholes** tab choose D_LOCATION_WIRELINE as the **Table Name**.
4. On the **Logs** tab choose DEFAULT_TEMPLATE_GAM_SP.HDR for the **Default Template** and REPORT HEADER WITH WIRELINE.HDR for the **Alternate Template**.
5. On the **Plan View** tab change the color and the symbol type to something appropriate.
6. On the **Section** tab choose **Show Line** and **Show Log HDR Information**.
7. Choose **Apply**. If nothing is displayed on the basemap, on the Data Source menu again and make sure that the new Data Source that you just created is the only data source checked on.

> **Note**: More than one Data Source and be Activated at one time. If you have chosen three different symbol types and three different colours for each of the Data Sources that you have created all should appear on your basemap.

8. Choose **Tools/*Show Source Browser window*** from the main menu bar and click on a well. This should open the alternate template browser window displaying the downhole geophysical information for that well.

Creating a Default Template HDR file in the Data Source

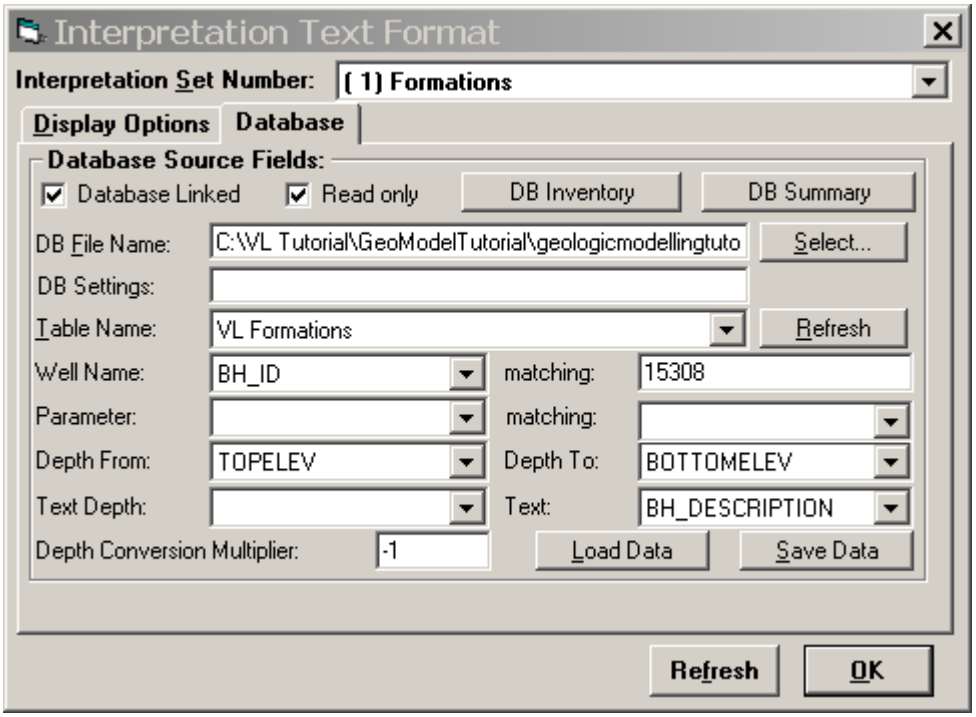
Header (HDR) files, which are created in the Log Editor, are used to control the presentation of borehole logs in cross section and preview modes. The **Logs** tab in the Data Source window allows the user to specify two different HDR files. The first – the **Default Template HDR File** – is used to present borehole logs on cross section. The second – the **Alternate Template HDR File** – is used to show borehole logs in preview mode. If the second HDR file is left blank, logs will be shown in preview mode using the Default Template HDR (see Data Source: Logs Tab). In Lesson 4, we made use of an existing HDR file; in this exercise, we will create a new HDR file.

TASK: Create a Default Template HDR File.

PROCEDURE:

1. In the **Logs** tab, click on the **New** button for the **Default Template HDR File**. This will open the Log Editor. You will see a blank borehole log that shows a depth track along the left-hand side.
2. Select **Edit/Create New…/**Text/Litho/Photo Column to create a new column of data.
3. Turn off the depth track by selecting **Format/**Display List (Shortcut: **F11**). Uncheck the **Show Depth Track** checkbox, and click **OK**.
4. Move the mouse pointer over this new column, right-click and select **Attributes**.
5. In the window that appears, enter a new **Name**: Geo Units

6. Turn off the text column by unchecking the **Show Text** check box.
7. Near the bottom of the window, change the **Litho column width** in the **Default Settings** to 3. (This will result in a log that is very wide, but it's necessary such that boreholes show up properly on cross section.)
8. Click on the **Database** tab to link the HDR file to the database.
   a. Check the **Database Linked** check box.
   b. Click on the **Select…** button and enter C:\VL Tutorial\GeoModelTutorial\Geologic ModellingTutorial.mdb, and click **Open**.
   c. In the **Table Name** box, click on "VL_Lithology", and hit **Refresh**.
   d. Select BH_ID for the **Well Name**, **matching** 15308
   e. Set the **Depth From** to BOTTOMELEV, and the **Depth To** to TOPELEV.
   f. Set the **Text** to BH_DESCRIPTON.
   g. Make sure all other fields are blank, as shown below.
   h. In the **Depth Conversion Multiplier** insert –1 (This will convert positive values to negative values)

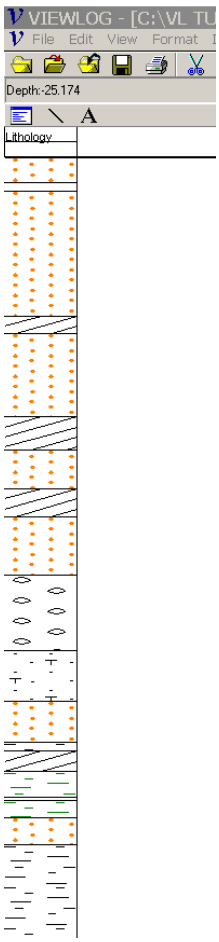


Connecting at Template HDR file to the Database.

9. Click on **Load Data**, select **Yes** and **OK** when prompted, and then hit **Refresh**.
10. Click on **OK** to close the window.
11. Select **Options/**Lithology Symbols to specify a new lithology symbol library.
    a. In the upper left-hand corner of the **Lithology Symbol Library** window, click on **File**, and select **Open Library**. You will be asked if you want to save your current library; select **No**.
    b. Select the library C:\VL Tutorial\VL Tutorial.LSM and click **Open**.

c. Hit **OK** to close the **Lithology Symbol Library**. Your log should resemble that shown below.

Note: Your lithology column may be of different width than that shown in the following figure.



The Default Template HDR File.

12. To save this log as a template HDR file, select **File/**Save as Template HDR. Save the file as C:\VL Tutorial\GeoModelTutorial\DefaultTemplate.HDR

13. Close the Log Editor by selecting **File/*Close***. If you saved the HDR template in the preceding step above, you can select **No** when prompted.

14. In **Logs** tab of the Data Source window, click on the **Select** button in the **Default Template HDR File**. Select the HDR file we just created: C:\VL Tutorial\GeoModelTutorial\DefaultTemplate.HDR

15. Click on **Apply**.

Note: In the **Logs** tab of the Data Source window, make sure that the **Template link field** is set to: Borehole ID number.

Creating an Alternate Template HDR file in the Data Source

The Alternate Template HDR File controls the display of borehole logs in Preview mode. Preview mode allows the user to open a preview window that shows the borehole log of a specific borehole, while viewing a plan view or cross section map in the main window. This preview window is activated by selecting **Tools/**Show Source Browser Window.

TASK: Create an Alternate Template HDR File.

PROCEDURE:

1. In the **Alternate Data Source Browser Template HDR File** section of the **Logs** tab, click on the **New** button. This will open the Log Editor. You will see a blank borehole log that shows a depth track along the left-hand side of the window.
2. First, we well edit the Depth Track:
   a. Select **Format/*Depth***.
   b. Set the **Depth Scale (On-Screen Edit Mode)** to 1:1000. Click on the **Copy Edit Settings** button, to use this same depth scale for Print and Preview Mode. Click **Refresh**.
   c. Click on the **Labels and Grid** tab, and set the **Label Increment** to 10 and the **Grid** and **Tick Increments** to 10 and 2, click on **OK**.
3. For this Alternate HDR file, we will be adding two new columns to display the borehole data in report format. Select **Edit/Create New…/**Text/Litho/Photo Column. Repeat this process to create the second, third, forth and fifth column. In a manner similar to that in the previous task, set up these new two columns as follows (Click on **Load Data** after completing each the **Database** tab for each set):
   a. Column 1:
      (1) **Display Options** tab:
         (a) **Name**: Formation
         (b) **Text Display**:
            (i) Check On **Show Text**
            (ii) In the **Default Settings** section at the bottom of the window, set the **Track Width** to 1.05 and the **Litho column width** to 0.5
         (c) **Contact Lines**:
            (i) **Line Type**: Solid
         (d) **Lithology Symbol Column**:
            (i) Check On **Show Litho Symbols**
      (2) **Database** tab:
         (a) Check on **Database Linked**.
         (b) **DB File Name**: C:\VL Tutorial\GeoModelTutorial\GeologicModellingTutorial. mdb
         (c) **Table Name**: VL Formations
         (d) **Well Name**: BH_ID, matching: 15308
         (e) **Depth From**: TOPELEV, **Depth To**: BOTTOMELEV
         (f) **Text**: BH_DESCRIPTION

b. Column 2:
   (1) **Display Options** tab:
      (a) **Name**: Lithology
      (b) **Text Display**:
         (i) Check On **Show Text**
      (c) **Contact Lines**:
         (i) **Line Type**: Solid
      (d) **Lithology Symbol Column**:
         (i) Check On **Show Litho Symbols**
   (2) **Database** tab:
      (a) Check on **Database Linked**.
      (b) **DB File Name**: C:\VL Tutorial\GeoModelTutorial\GeologicModellingTutorial. mdb
      (c) **Table Name**: VL Lithology
      (d) **Well Name**: BH_ID, matching: 15308
      (e) **Depth From**: TOPELEV, **Depth To**: BOTTOMELEV
      (f) **Text**: BH_DESCRIPTION

c. Column 3:
   (1) **Display Options** tab:
      (a) **Name**: Formation Age
      (b) **Text Display**:
         (i) Check On **Show Text**
      (c) **Contact Lines**:
         (i) **Line Type**: Solid
      (d) **Lithology Symbol Column**:
         (i) Check On **Show Litho Symbols**
   (2) **Database** tab:
      (a) Check on **Database Linked**.
      (b) **DB File Name**: C:\VL Tutorial\GeoModelTutorial\GeologicModellingTutorial. mdb
      (c) **Table Name**: VL Formation Age
      (d) **Well Name**: BH_ID, matching: 15308
      (e) **Depth From**: TOPELEV, **Depth To**: BOTTOMELEV
      (f) **Text**: BH_DESCRIPTION

d. Column 4:
   (1) **Display Options** tab:
      (a) **Name**: Aquifer
      (b) **Text Display**:
         (i) Check On **Show Text**
      (c) **Contact Lines**:

(i) **Line Type**: Solid

(d) **Lithology Symbol Column**:

(i) Check On **Show Litho Symbols**

(2) **Database** tab:

(a) Check on **Database Linked**.

(b) **DB File Name**: C:\VL Tutorial\GeoModelTutorial\GeologicModellingTutorial. mdb

(c) **Table Name**: VL Aquifer

(d) **Well Name**: BH_ID, matching: 15308

(e) **Depth From**: TOPELEV, **Depth To**: BOTTOMELEV

(f) **Text**: BH_DESCRIPTION

e. Column 5:

(1) **Display Options** tab:

(a) **Name**: Screen

(b) **Text Display**:

(i) Check Off **Show Text**

(c) **Contact Lines**:

(i) **Line Type**: Solid

(d) **Lithology Symbol Column**:

(i) Check On **Show Litho Symbols**

(3) **Database** tab:

(a) Check on **Database Linked**.

(b) **DB File Name**: C:\VL Tutorial\GeoModelTutorial\ GeologicModellingTutorial.mdb

(c) **Table Name**: VL Aquifer

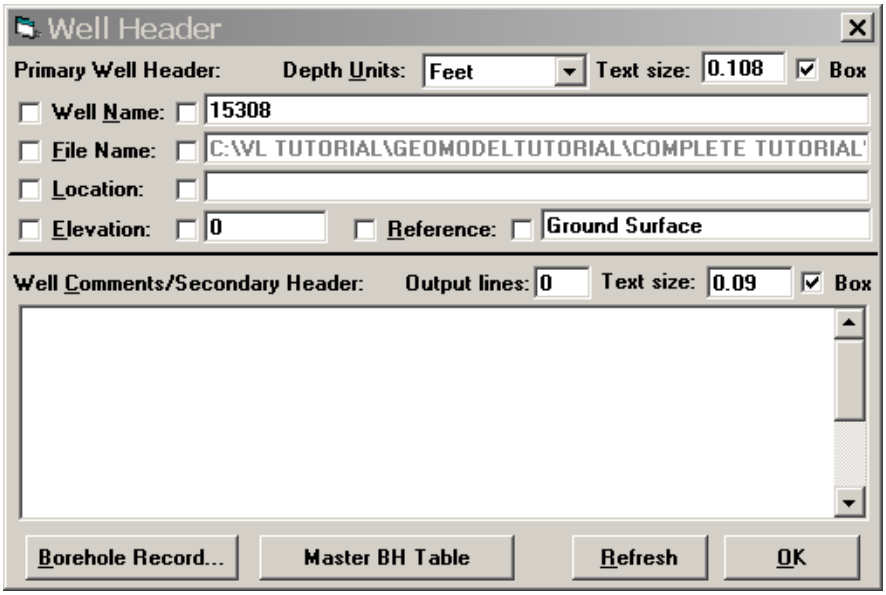
(d) **Well Name**: BH_ID, matching: 15308

(e) **Depth From**: TOPELEV, **Depth To**: BOTTOMELEV

Text: BH_DESCRIPTION

4. Click on **OK**.

5. To change the units from metres to feet at the top of the log, select **Format/**Header, and change the **Depth Units** from Metres to Feet. You will be asked if you want to convert your database as well; make sure you select **No** (This is important!).



Changing the Well Header Units from Metres to Feet.

6. The next step is to create a header image for the logs. To do this, select **Format/**Page/Global Settings and click on the **Header Image** tab. For this tutorial, we have already created a MAP file that can be used as the header for the borehole logs. You can select C:\VL Tutorial\GeoModelTutorial\VL Tutorial Header.map. Place a check beside the **In line image** box and click **OK**.

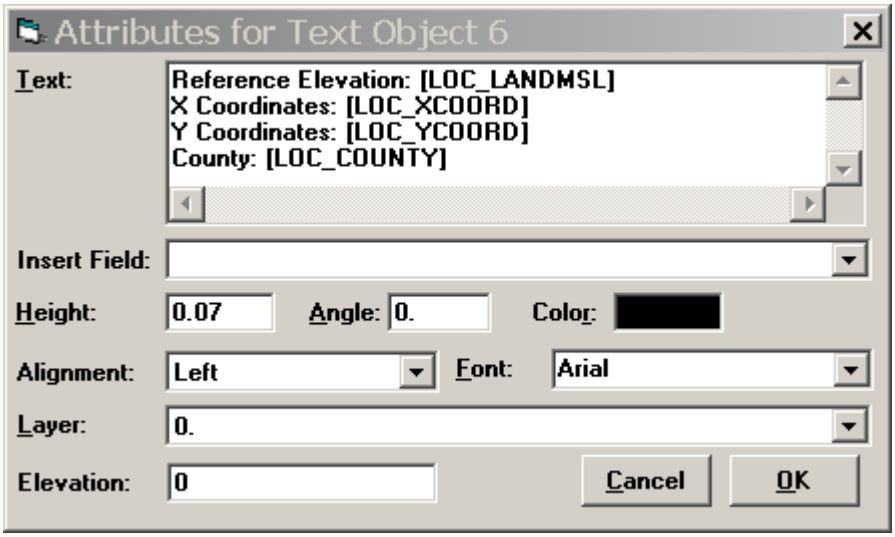
7. (Optional) If you wish to create your own header image, select **Format/**Page/Global Settings. Make sure the **File:** text box is blank, and hit the **Edit…** button. Click **Yes** to create a new header image file; this will open up the VIEWLOG Map Editor. A summary of the procedure to create a header image MAP file is shown here:

a. Select the **Draw/**New Polyline and **Draw/**Box menu items to draw borders and title boxes.

b. Add text by using the **Draw/**Text menu item.

c. Another useful feature can be accessed with the **File/**Properties menu item. This will open the **Map File Properties** window, which can be used to link the map file to a database. This can allow the user to create titles (e.g., borehole names) that are pulled from the database. In our example, we have linked to C:\VL Tutorial\GeoModelTutorial\GeologicModellingTutorial.mdb database, and to the VL_Well Master Location table. Select BH_ID for the **Match Field**.

(1) Once these options are selected, you can add information from the database as text by inserting text fields.

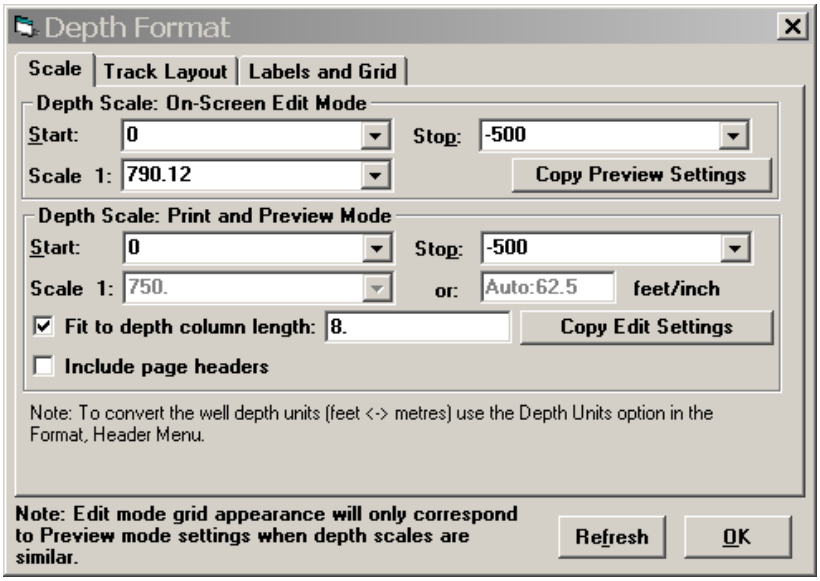


Inserting Text Fields.

(2) In our image header, we have already added several text fields. These are denoted with square brackets [ ].

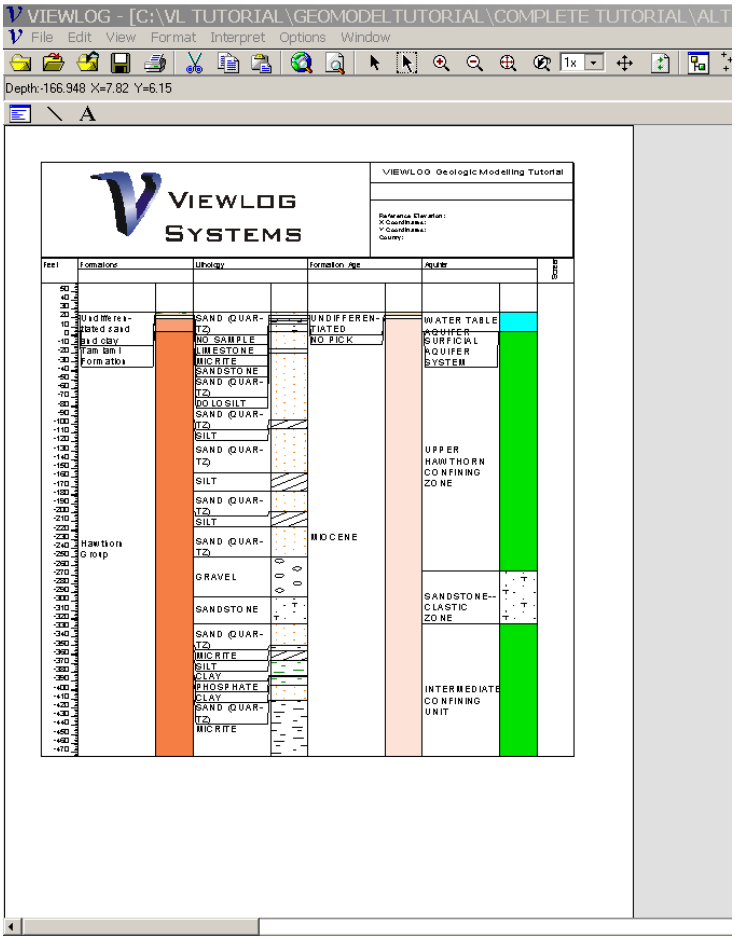
(3) Once you have a MAP file that you are satisfied with, save the file. You can then link your HDR file to the MAP file, as outlined above.

8. In Page View, if you zoom out, you may notice that the log does not fit properly onto on 8.5 x 11 page. To spread the log over two or more pages, select the **Format/**Depth menu item, and place a check beside the Include page headers box, such that the image header is attached to each page. Then change the **Fit to depth column length** to 8. Click on **OK**.



Changing the Column Depth in Page View.

9. In the Log Editor, if you change to Page View, you should see a figure that resembles the following.



Page Preview Mode for the Alternate Template HDR File.

10. Save this Template HDR file by selecting **File/**Save as Template HDR. Save the file a C:\VL Tutorial\GeoModelTutorial\Alternate Template.HDR

11. In the Data Source window, click on the **Select** button in the **Alternate Data Source Browser Template HDR File** section. Select the HDR file we just created: C:\VL Tutorial\GeoModelTutorial\Alternate Template.HDR

> **Note:** In the **Logs** tab, be sure that the **Template Link Field** is set to Borehole ID Number, because we're connecting with the Loc_ID in the database.

Selecting and Editing Borehole Details

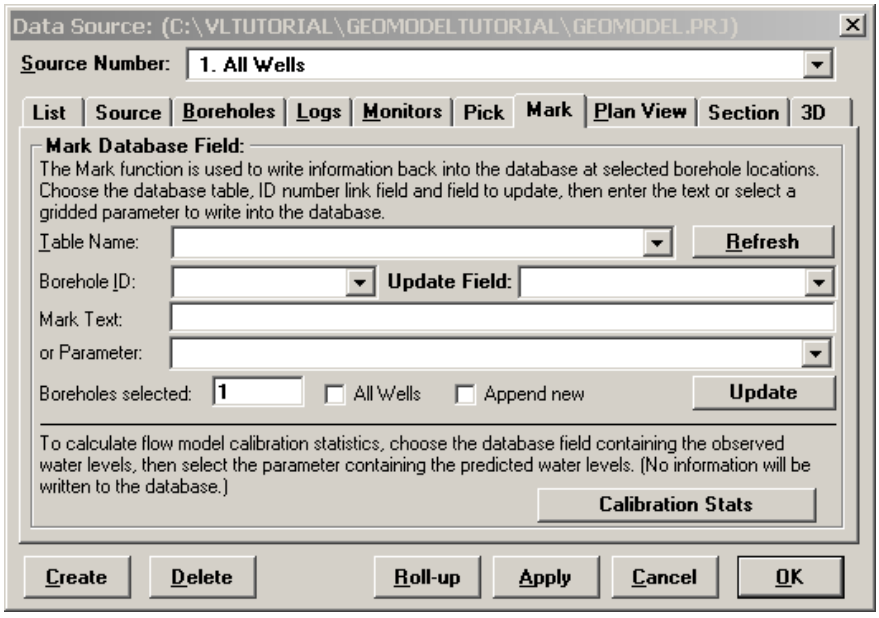
The borehole information, including ALL fields in the Data Source query or table, can be displayed as a floating table window. Because all fields in the table or query are available, the user can add easily add related fields for editing. Editing changes are immediately written back to the database.

TASK: Select and edit the borehole details.

PROCEDURE:

1. In World coordinates, choose **Edit/**Select Objects (Shortcut: **F2**).

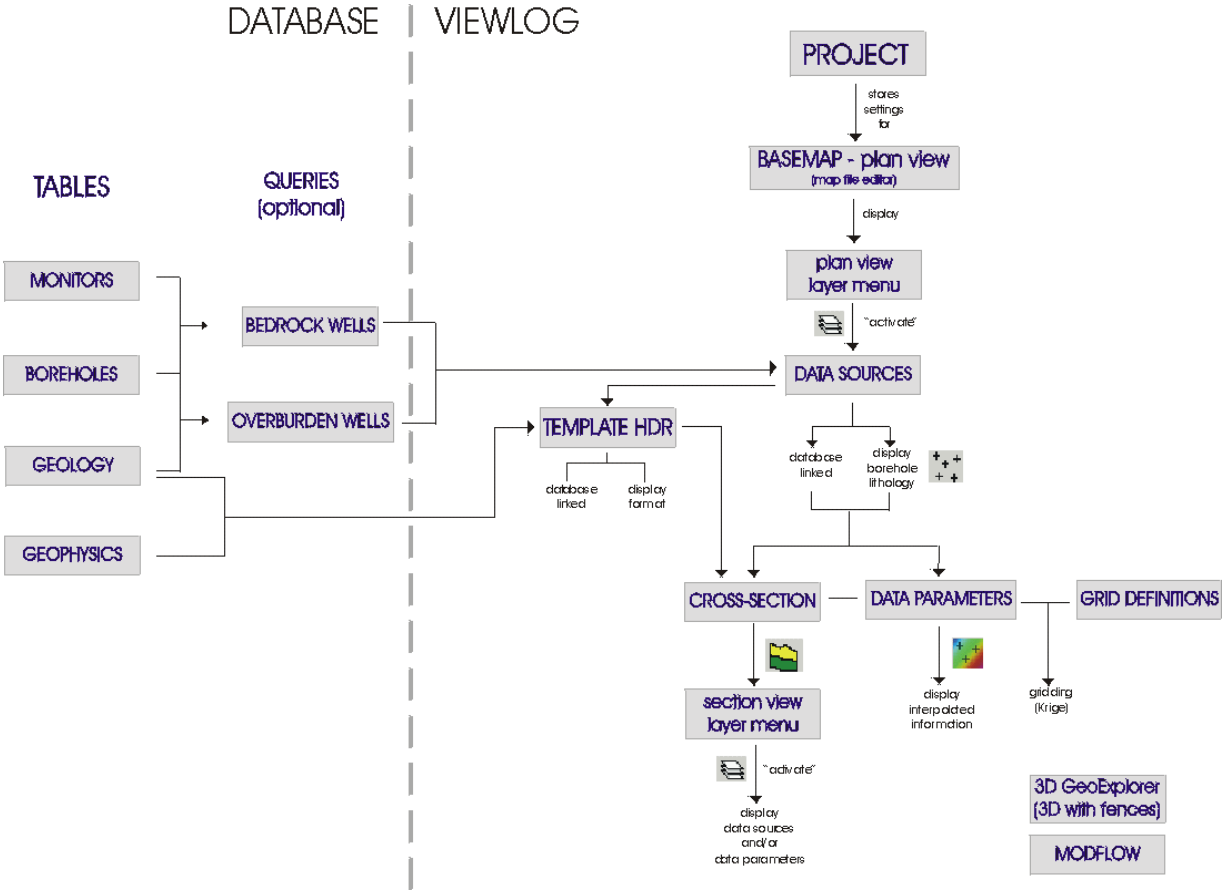
2. Double-click on a well to load the table window.
3. Subsequent mouse clicks on other boreholes will refresh the well information in the table window.
4. Boreholes can be moved and transformed using the same procedure as that for editing other map objects such as lines and text.
5. The **Mark** tab (shown below; see also Data Source: Mark Tab) is used to write information back into the database at selected borehole locations. Once a group of boreholes is selected, any text or numeric value can be overwritten into the field in the borehole table, or, the value of a gridded parameter can be written. Before using this feature, it is recommended that a blank table be created in MS-ACCESS. The information can then be written from VIEWLOG to the new, blank table.



The Mark Tab in the Data Source Window.

Lesson 6: Working with Data Parameters

Data Parameters are used to manage any mappable field measurements. Examples include geologic surfaces, water level snapshots, rock properties, etc. The Data Parameter menu brings together a database link, gridding and interpolation details, and plan-view, section and 3-D display options.



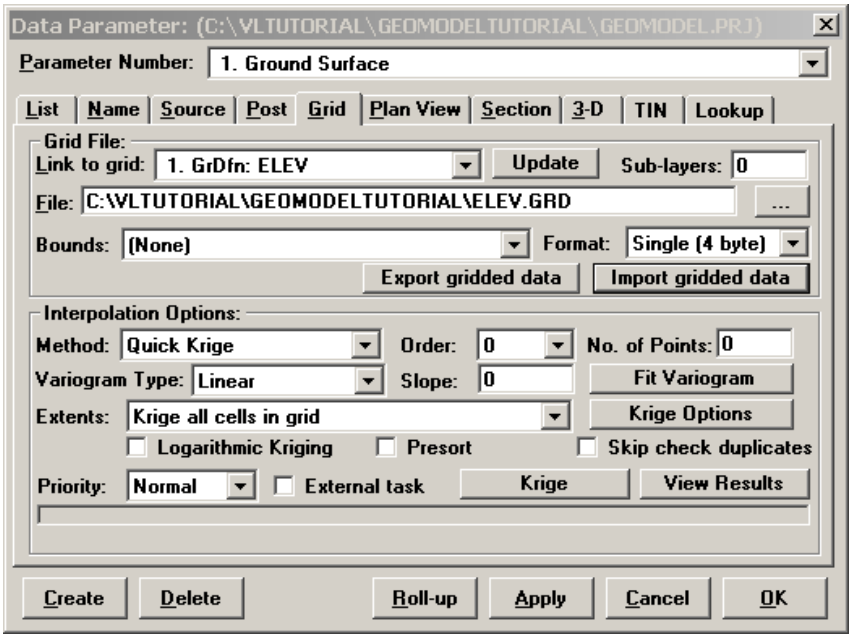
Importing a Grid File for a Data Parameter

> **Note:** It is very important that you have completed the previous tutorials as the following tutorial is based on the base map, project links and Data Sources that you have already completed.

TASK: Import the ground surface and create a Data Parameter.

PROCEDURE:

1. Start by opening up the Data Parameter window. This can be done by selecting **Project Data/**Data Parameter, or by clicking the icon. Because we will be creating our first Data Parameter, a window will appear that tells you that there are no Data Parameters defined. Click **Yes** to create a new Data Parameter and the Data Parameter window will appear.
2. Click on the **Name** tab and call this parameter "Ground Surface".
3. Click on the **Grid** tab, type C:\VL Tutorial\GeoModelTutorial\elev.grd for the **File**.
4. Click the **Import gridded data** button. In the window that appears, first select *.agr as the file type. Then select the C:\VL Tutorial\GeoModelTutorial\Shape Files\elev.agr file. When you select this file, you will be asked of you wish to create a new grid definition for the imported data. Select **Yes**. You will then be asked if you wish to create the grid file. Select **Yes**, and make sure the grid file is saved as: C:\VL Tutorial\GeoModelTutorial\elev.grd.



The Grid Tab in the Data Parameter Window.

5. You have now created a grid file that will be used for all new surfaces.

> **Note:** To create a second parameter, click the **Create** button in the Data Parameter menu. When creating a parameter in the menu, VIEWLOG can duplicate the settings in the currently defined parameter. This provides a quick method to generate parameters that require only minor modifications from the original.

6. Before we edit the properties of the rest of this Data Parameter, we need to create a layer for the ground surface. Make sure the Data Source and Data Parameter windows are closed.
7. Open the Layer menu and hit the icon to create a new layer. Name this layer "Ground Surface DEM".

8. Move this layer down to Layer 1 by highlighting the layer and clicking the icon.
9. Make this the current layer by highlighting it. Right-click the layer, and select **Set to Current drawing layer**.
10. Make sure that this new layer is in World coordinates. To do this, check the left-most icon. If the icon is shown, double click this icon to change this layer to World coordinates. The icon will be changed to: .

> **Note:** To change the current layer, first highlight the layer and click the icon.

Creating and Listing Data Parameters

The Data Parameter **List** tab presents a list of all the parameters available in this project. The check box beside the name indicates whether the parameter is "activated" within the current map. To activate a parameter, check the box beside the name, and then select a layer on which it will be displayed in the current map (see Data Parameter: List Tab).

It is important to note that for a Data Parameter to be visible is must be activated on a visible layer, and the display options (see Data Parameter: Plan View Tab, and Data Parameter Section Tab) must be set appropriately.

TASK: Assign the new Data Parameter to a new layer in the **List** tab.

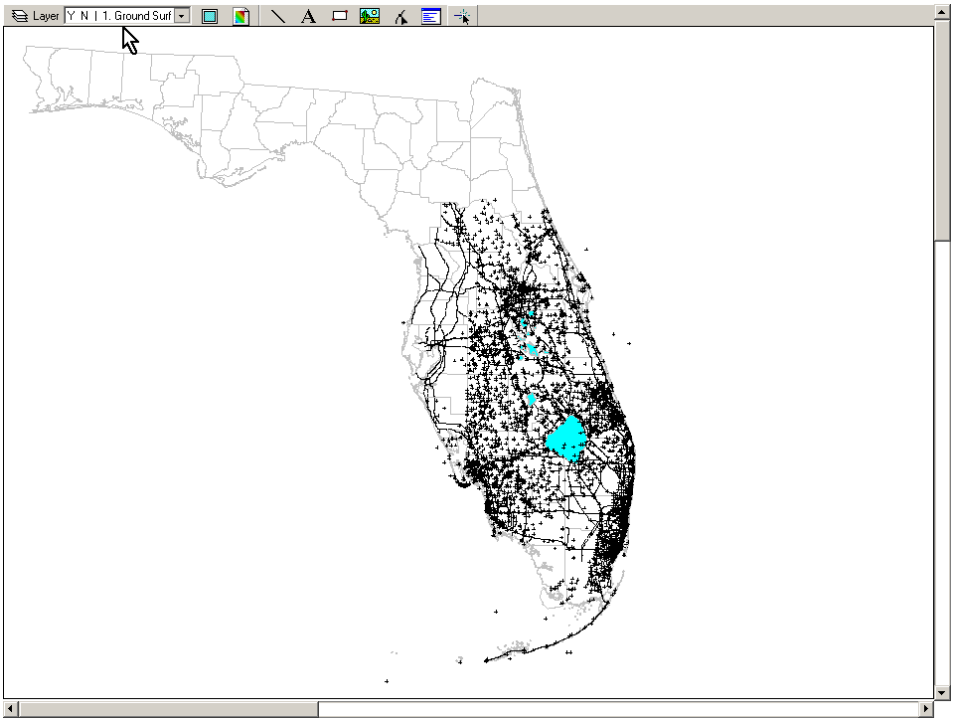
PROCEDURE:

1. Open the Data Parameter window.

> **Note:** The Data Parameter window can be opened several ways. With the keyboard, you can use either **Project Data/**Data Parameter or **F12**. With the mouse, you can click on the icon, or right-click and select **Data Parameter**.

2. Select the **List** tab.
3. Place a check beside the Ground Surface Data Parameter.
4. From the **Activated on Layer** drop-down menu, select the layer you just created, Ground Surface DEM.

> **Note:** Make sure the current layer is set to Ground Surface DEM. You can check this in the upper-left corner of the menu bar, as shown below.



Checking the Current Layer.

Modifying the Display of Data Parameters in Plan View

The **Plan View** tab controls how the parameter is presented in plan view (see Data Parameter: Plan View Tab).

TASK: Configure the **Plan View** tab to modify the display of a Data Parameter.

PROCEDURE:

1. Open the Data Parameter window.
2. Check on and highlight the Ground Surface Data Parameter in the **List** tab.
3. Set the **Contour Start** and **Stop** values to –2 and 200, respectively.
4. Check on the **Show Solid Color Fill** and **Hill Shade** check boxes and choose the **Blue-Red Spectrum** for the color **Palette**.
5. Click on **OK**.

Clipping Gridded Data

Another useful feature is the use of a closed polygon to clip the data. This allows the user to show only gridded data within a desired area, and is done by creating a new Data Parameter on the same grid. In this new parameter, each cell will be assigned either a 1 or a 0; areas assigned to 0 will not be shown.

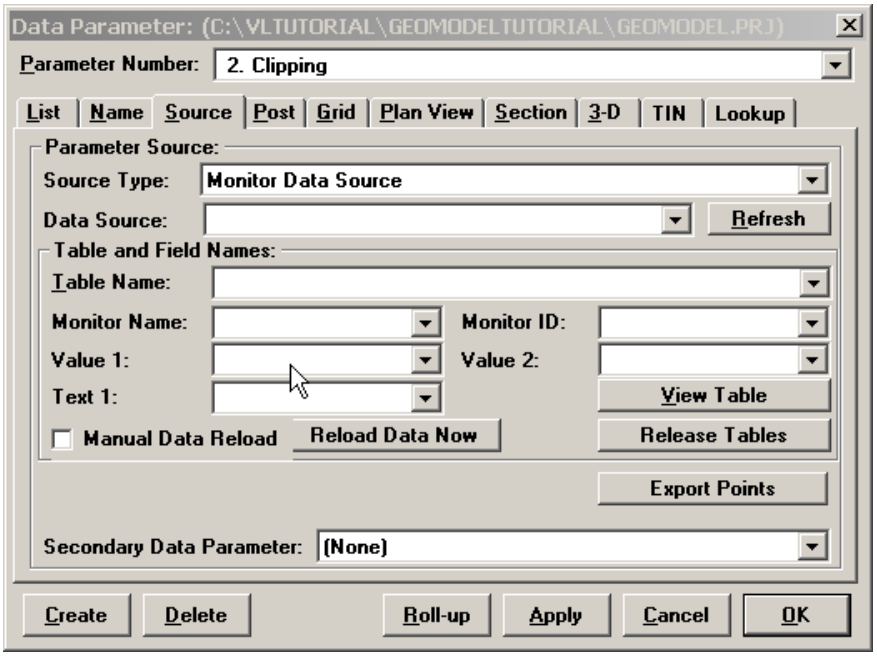
TASK: Clip the ground surface gridded data.

PROCEDURE:

1. First, create a new layer called Clipping Bounds. Open the Layer menu and hit the icon to create a new layer. Name this layer "Clipping Bounds". Set this layer to the current layer by highlighting it, and right clicking and selecting **Set to Current drawing layer**.
2. You can create your own clipping bounds by using **Draw/**New Polyline. When you have created your polyline, right click to open the **Display Properties** window. Make sure your polyline is "closed".

> **Note:** We have created a map file called clip.map. You can use the **File/**Import/merge to bring this map file into your VIEWLOG project. When you import this file, it will be placed in its own new layer called Clipping Bounds and polylines.

3. We now need to create a Data Parameter that will be used to clip the Ground Surface data. In this case, all cells in this new Data Parameter will be either 0 or 1. Where a cell is assigned a value of 1, the ground surface will be shown; where a value of 0 exists, it will not be shown. To create a new Data Parameter, select **Project Data/**Data Parameter, and click on the **Create** button. Select **No**, when asked if you want to replicate an existing Data Parameter, and select **No** to append the new parameter to the bottom of the list.
4. In the **Name** tab, call this new Data Parameter 'Clipping'.
5. On the **Source** tab, make sure there are no connections to any data, as shown below.

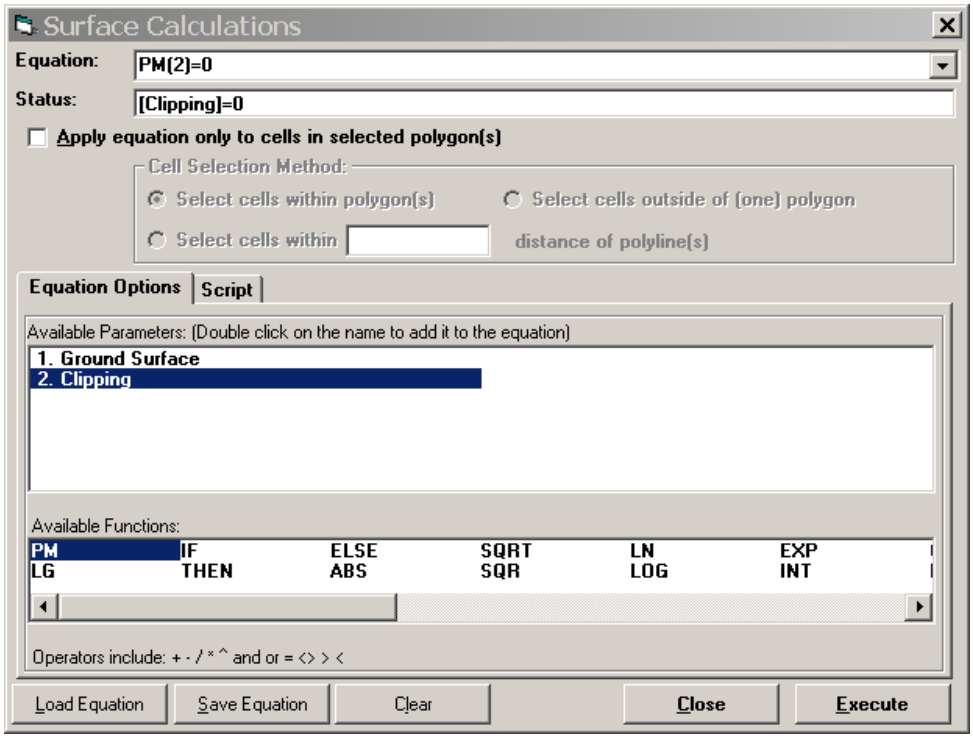


The Source Tab for the Clipping a Data Parameter.

6. On the **Grid** tab (see Data Parameter: Grid Tab), link this new Data Parameter to the Grid called Elev. Select the **…** button to create a new grid file called C:\VL

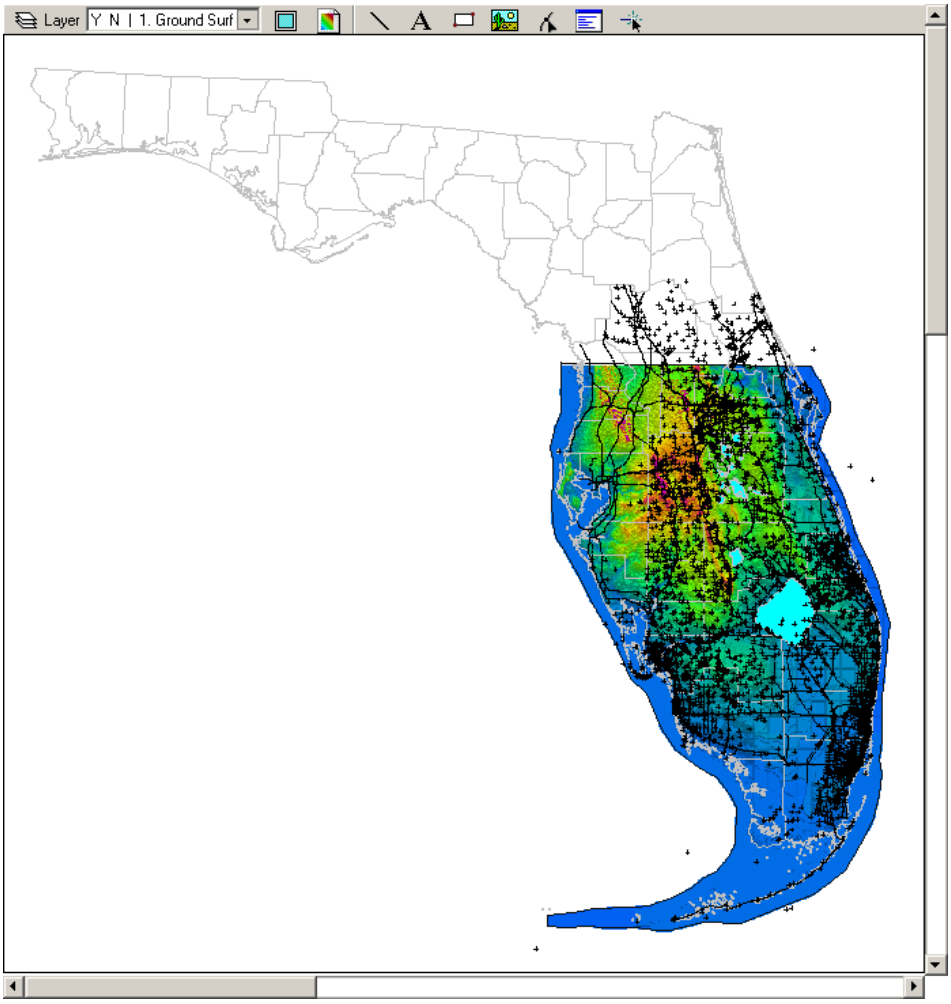
Tutorial\GeoModelTutorial\Clip.grd, and click **Apply**. Close the Data Parameter window.

7. Open **Tools/**Parameter Calculator.
8. Fill out the equation line as shown below. This will assign a value of 0 to all cells:



Assigning a Constant Value to a Grid with the Parameter Calculator.

9. Click on **Execute**, and click **Yes** to create the new grid file. You have now created a grid file where all cells are assigned a value of 0.
10. The next step is to assign a value of 1 to all cells within the clipping polygon.
    a. Make sure the clipping polygon is selected.
    b. Open **Tools/**Parameter Calculator, and in the Equation: line, type PM(2) = 1. Make sure you place a check beside the **Apply equation only to cells in selected polygon(s)** box; otherwise, you will be assigning a 1 to all cells.
    c. Click on **Execute**, and click **Yes** to update the grid file.
11. Open the Data Parameter window and select the Ground Surface parameter. Select the **Grid** tab, and set the **Bounds** to 2. Clipping. On the **List** tab, deactivate (uncheck) the 2. Clipping Data Parameter.
12. The clipped ground surface should resemble that shown below.



The Clipped Ground Surface.

Creating a Data Parameter that is Linked to the Database

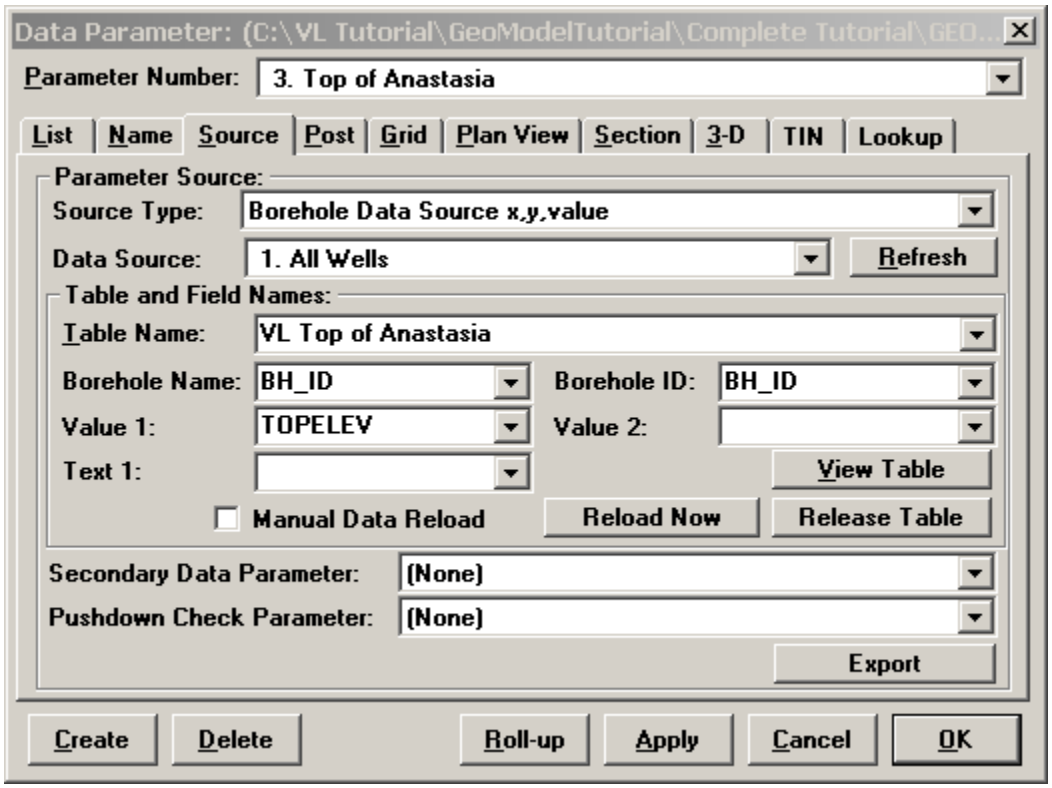
In the previous example, we imported an existing file to create a Data Parameter for the grid surface. In this example, we will create a Data Parameter by linking to the database. This new Data Parameter will extract borehole data from the database, and we will then interpolate the borehole data onto the existing grid.

TASK: Create a Data Parameter that is linked to the database.

PROCEDURE:

1. Create a new layer called Surfaces. Open the Layer menu and hit the icon to create a new layer. Name this layer "Surfaces". Set this layer to the current layer by highlighting, then right clicking and selecting Set to Current drawing layer. Move this layer down to the 1. position by using the or icons.
2. Open the Data Parameter window, and from the List tab, click on Create. Select **Yes** to replicate properties from the existing Data Parameter, and select **No** to append the new Data Parameter to the end of the parameter list.

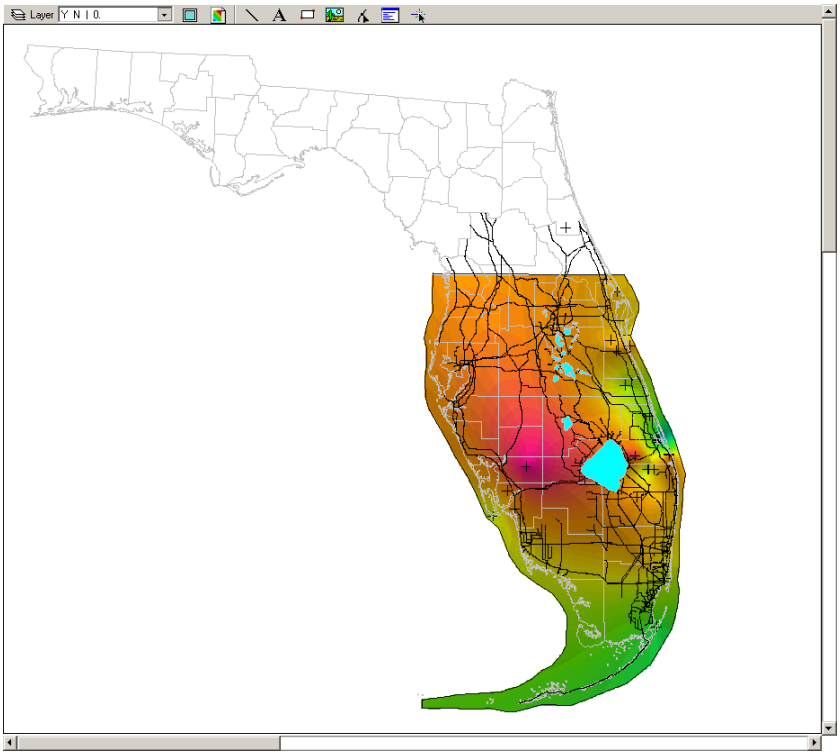
3. In the **Name** tab, call this new parameter "Top of Anastasia Formation". Go back to the **List** tab, and place a check next to this new parameter. Uncheck the parameter called "Ground Surface". Also, make sure that the Parameter Number at the top of the window shows that the current parameter is 3. Top of Anastasia Formation.
4. Also in the **List** tab, make sure that this new parameter is activated on the new Surfaces layer
5. In the **Source** tab, fill out the table as shown below.
6. **Note:** Hit the **Refresh** button once you've selected the Data Source.



The Source tab of the Data Parameter window.

7. The **Source** Tab of the Data Parameter Window.
8. Note that this Data Parameter is linked to the All Wells Data Source. In addition, this parameter is linked to a query in the database called VL Top of Anastasia.
9. In the **Post** tab, you can view the data points by checking the **Show Symbol** check box. Values can be posted by checking the **Post Value** check box.
10. In the **Grid** tab, enter the grid file as: C:\VL Tutorial\GeoModelTutorial\Top of Anastasia.grd. Set the Bounds to '2. Clipping'.
11. Krige the data by choosing the Quick Krige **Method**. Then click on the **Krige** button. Once kriging is complete, click on **Apply**.
12. In the **Plan View** tab click on **Auto Scale** to scale the contour limits to the data.
13. You should see a figure that resembles that shown below.

Note: In the figure below, the All Wells Data Source is deactivated. To do this, open the Data Source window, and on the **List** tab, uncheck the All Wells Source (see Data Source: List Tab).



The Gridded Top of Anastasia Formation.

14. You can now create Data Parameters as shown below. The database queries that are required for each Data Parameter are also listed:

Data Parameter	Database Query	Grid File
Top of Hawthorn	VL_Top of Hawthorn	Top of Hawthorn.grd
Top of Suwannee Limestone	VL_Top of Suwannee	Top of Suwannee.grd
Top of Ocala	VL_Top of Ocala	Top of Ocala.grd
Top of Avon Park	VL_Top of Avon Park	Top of Avon.grd
Top of Oldsmar	VL_Top of Oldsmar	Top of Oldsmar.grd

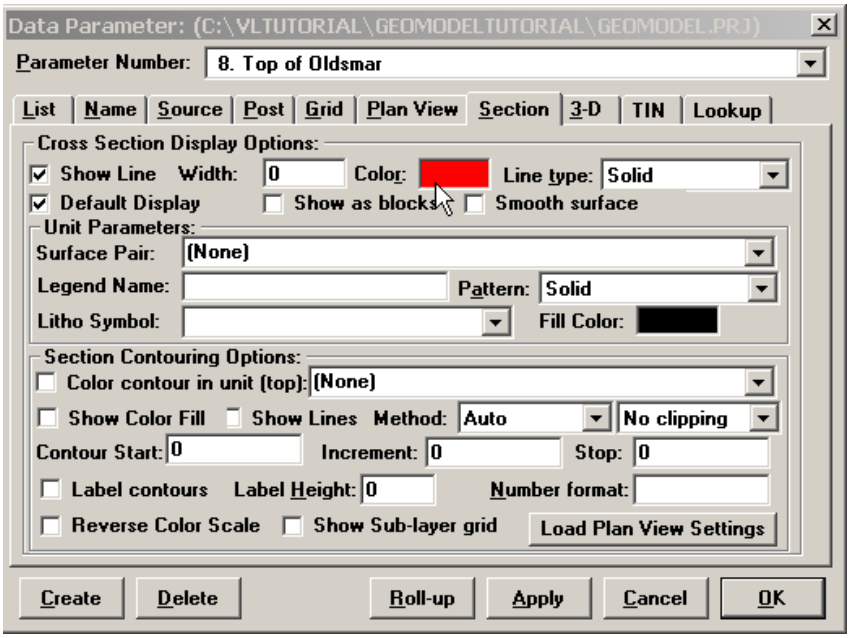
Preparing a Cross Section with Data Parameters

In the previous lesson, we generated a simple cross section that showed only the boreholes. Now that we have defined some geologic surfaces, we can add a degree of complexity to our cross sections by including geologic information from these surfaces.

TASK: Generate a cross section that includes Data Parameters.

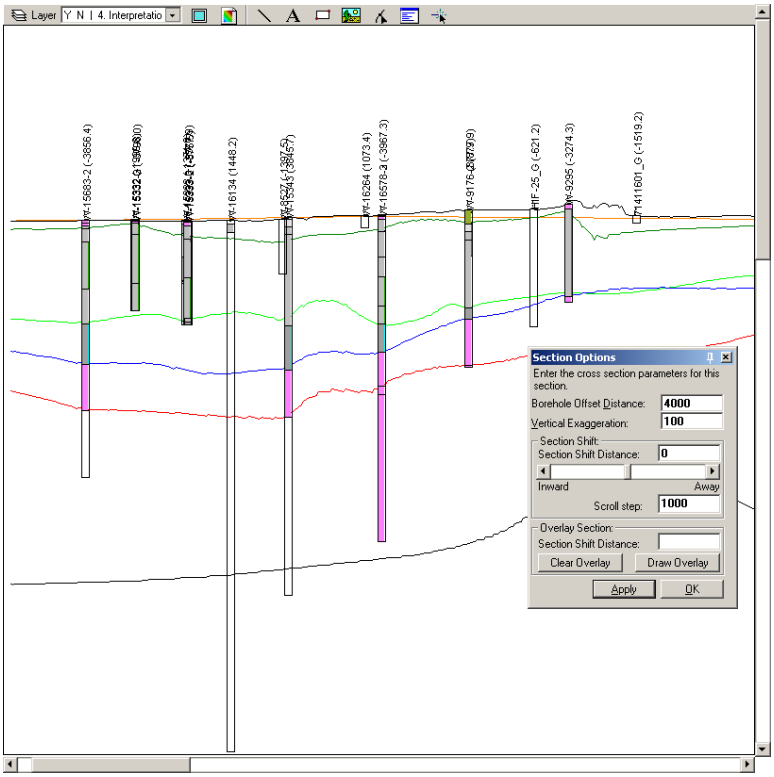
PROCEDURE:

1. Working on your Basemap.map in World coordinates, deactivate all of the Data Parameters.
2. Turn on the All Wells Data Source. Open the Data Source window by clicking on the icon, and activate the All Wells Data Source by placing a checking beside it in the **List** tab.
3. Make a new layer called Section lines and set this as the current layer.
4. Select **Draw/**New Polyline and draw a line through a cluster of boreholes from the West to East.
5. Choose **Edit/**Select Objects (or click **F2**) to select the line you just created.
6. Choose **View/**Cross Section Setup and change the **Borehole Offset Distance** to 4000 and the **Vertical Exaggeration** to 100.
7. Select **View/**Create Cross Section and choose **Yes**. A cross section of the boreholes should appear. If the boreholes do not appear, zoom in on a portion of the cross section.
8. The color of each section line can be edited in the **Section** tab of the Data Parameter window, as shown in the following figure. Use this tab to create a unique color for each of the formation Data Parameters.



Changing the Color of a Cross Section Line.

9. In the **List** tab, activate the Ground Surface, Anastasia, Hawthorn, Suwannee, Ocala, Avon Park and Oldsmar Data Parameters.
10. The figure below shows a sample cross section with Data Parameters shown.



Cross Section Showing Formation Lines and Boreholes.

Parameter Calculator for Surface Correction

Upon closer examination of the derived cross section shown above, you will see that some of the parameter lines (i.e., Tops of Formations) are incorrect. For example, the blue line (Top of Ocala Formation) is crossing above the lime green line (Suwannee Limestone) in some locations. These kinds of problems are artifacts of the gridding procedure; either there are some bad data picks or simply a lack of information in that particular area. By using the Parameter Calculator, we can easily adjust these problems.

TASK: Use the Parameter Calculator to correct geologic surfaces.

PROCEDURE:

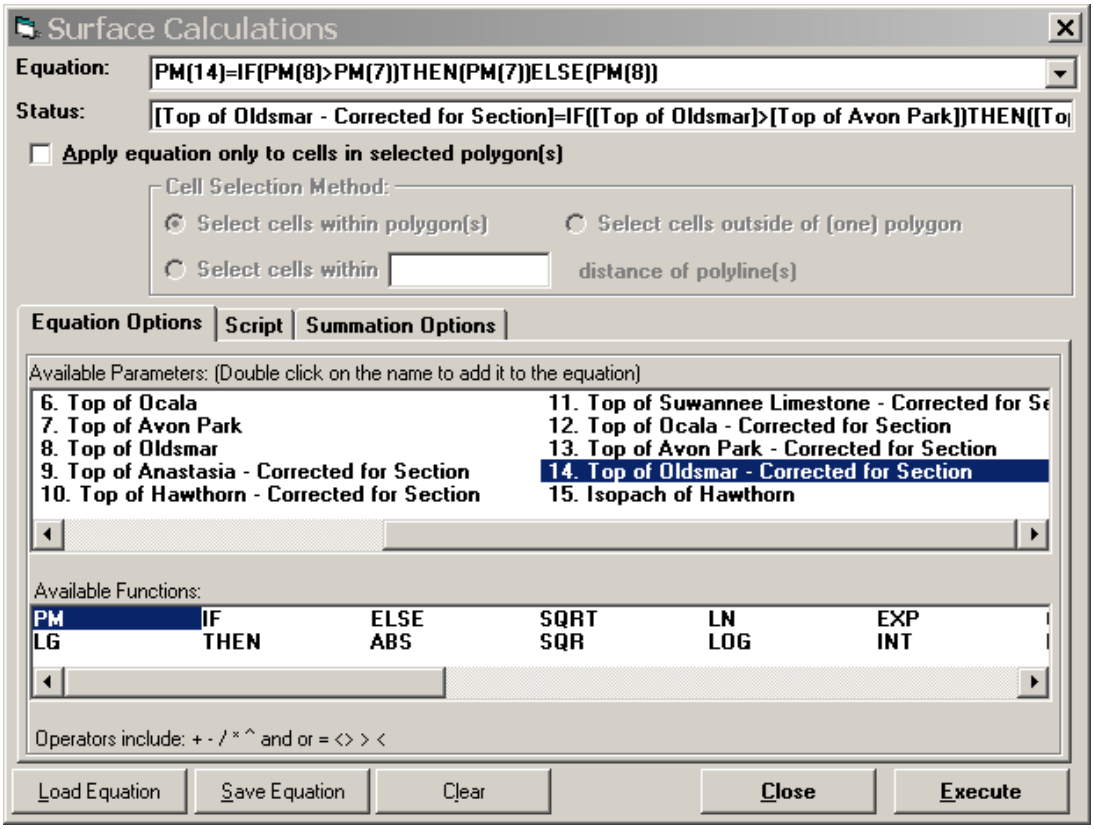
1. Starting from the lowest formation (Oldsmar), we will work our way through to the top of the defined parameters.
2. Open the Data Parameter menu. On the **List** tab, highlight (activate) the Top of Oldsmar parameter.
3. Click the **Create** button and choose **Yes** to replicate current Data Parameter settings in the new parameter.
4. Activate the new Oldsmar parameter (it should be Parameter 9).
5. On the **List** tab name the new Parameter, Top of Oldsmar - Corrected for Section
6. On the **Grid** tab, rename the **File** to Top of Oldsmar Section.grd and click **Krige**. This will create a new grid file for the section on which we can now perform calculations without losing our plan view grid files.

7. Choose **Tools/**Parameter Calculator. On this menu, we can define any equation that we wish to perform on the chosen parameter. In this case, we want to define the Top of the Oldsmar to never be greater than the Top of the Avon Park, and so on up the section.
8. In the **Equation** line, enter the following, as shown in the figure below:

> **Note**: Your parameter numbers may not exactly coincide with those shown here. When typing in the equation, you can use both keyboard entries and double-clicks on the desired parameter from the list of available parameters.

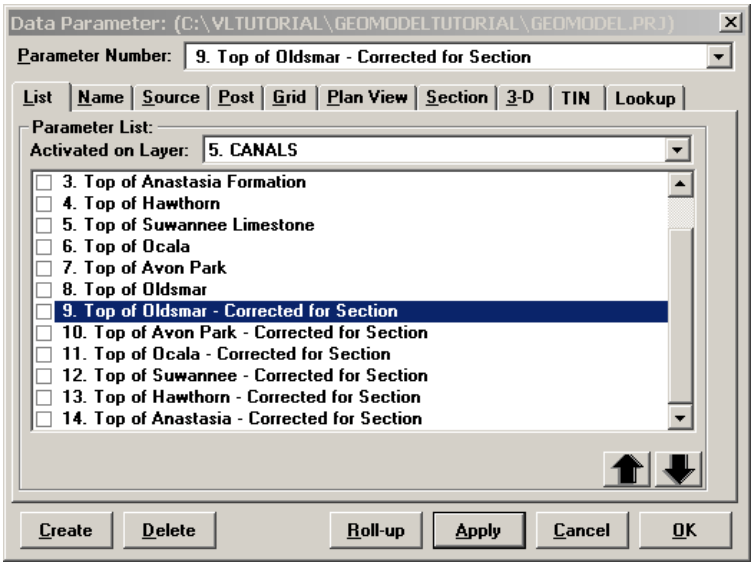
Equation: PM(9)=IF(PM(8)>PM(7))THEN(PM(7))ELSE(PM(8))

Status: [Top of Oldsmar - Corrected for Section]=IF([Top of Oldsmar]>[Top of Avon])then[Top of Avon]else[Top of Oldsmar]


Surface Calculations
Equation:
PM(14)=IF(PM(8)>PM(7))THEN(PM(7))ELSE(PM(8))
Status:
[Top of Oldsmar - Corrected for Section]=IF([Top of Oldsmar]>[Top of Avon Park])THEN([To
Apply equation only to cells in selected polygon(s)
Cell Selection Method:
Select cells within polygon(s)
Select cells outside of (one) polygon
Select cells within
distance of polyline(s)
Equation Options
Script
Summation Options
Available Parameters: (Double click on the name to add it to the equation)
6. Top of Ocala
7. Top of Avon Park
8. Top of Oldsmar
9. Top of Anastasia - Corrected for Section
10. Top of Hawthorn - Corrected for Section
11. Top of Suwannee Limestone - Corrected for Se
12. Top of Ocala - Corrected for Section
13. Top of Avon Park - Corrected for Section
14. Top of Oldsmar - Corrected for Section
15. Isopach of Hawthorn
Available Functions:
PM IF ELSE SQRT LN EXP
LG THEN ABS SQR LOG INT
Operators include: + - / * ^ and or = <> > <
Load Equation
Save Equation
Clear
Close
Execute

The Parameter Calculator Menu for Corrected Surfaces.

9. Click **Execute**.
10. Create new parameters for each of (in order) Avon Park, Ocala, Suwannee, Hawthorn and Anastasia, as shown below.



Creating New Data Parameters for Section Correction.

11. Repeat for each formation, comparing each new parameter with the one above.

PM(10)=IF(PM(7)>PM(6))THEN(PM(6))ELSE(PM(7))

PM(11)=IF(PM(6)>PM(5))THEN(PM(5))ELSE(PM(6))

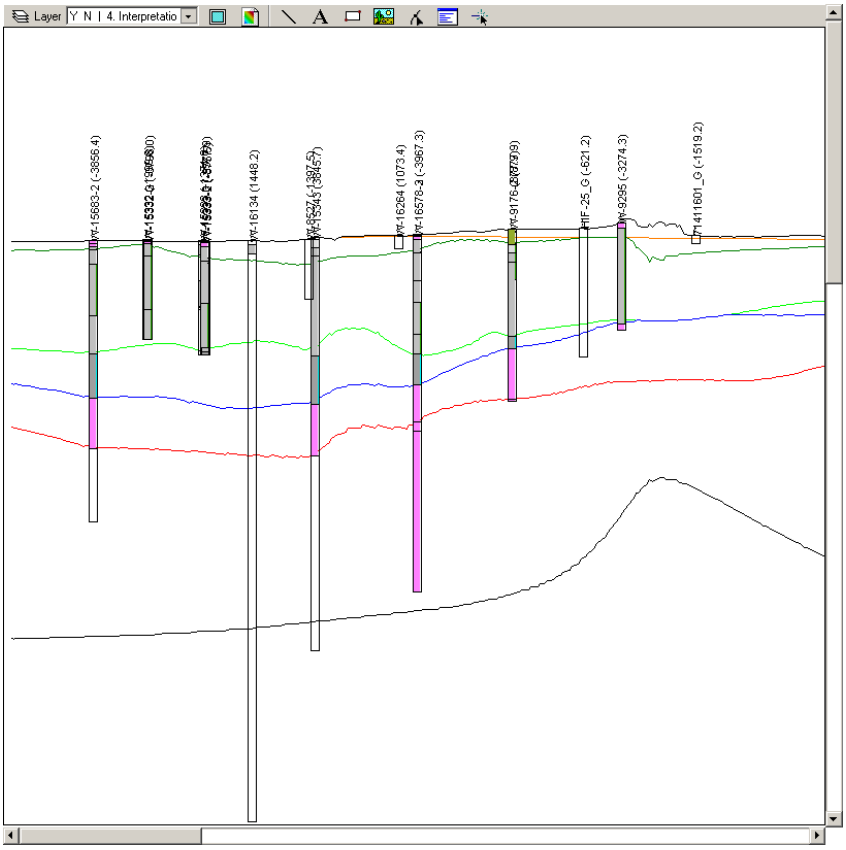
PM(12)=IF(PM(5)>PM(4))THEN(PM(4))ELSE(PM(5))

PM(13)=IF(PM(4)>PM(3))THEN(PM(3))ELSE(PM(4))

PM(14)=IF(PM(3)>PM(1))THEN(PM(1))ELSE(PM(3))

12. Return to the Data Parameter menu, unclick (deactivate) all the parameters that you generated for the plan view and select the new parameters you generated for the section work as well as the ground surface. Click **Apply**.

Note: The Parameter Calculator can be extremely useful for many other aspects of hydrological and geological modeling. For example, creating isopach maps of formations.



Corrected Cross Section.

Creating Surface Pairs on Cross Section

In addition to creating lines on cross section, VIEWLOG can pair Data Parameters, and fill the area between the two lines on section. This process is referred to as Surface Pairing.

TASK: Create surface pairs for Data Parameters.

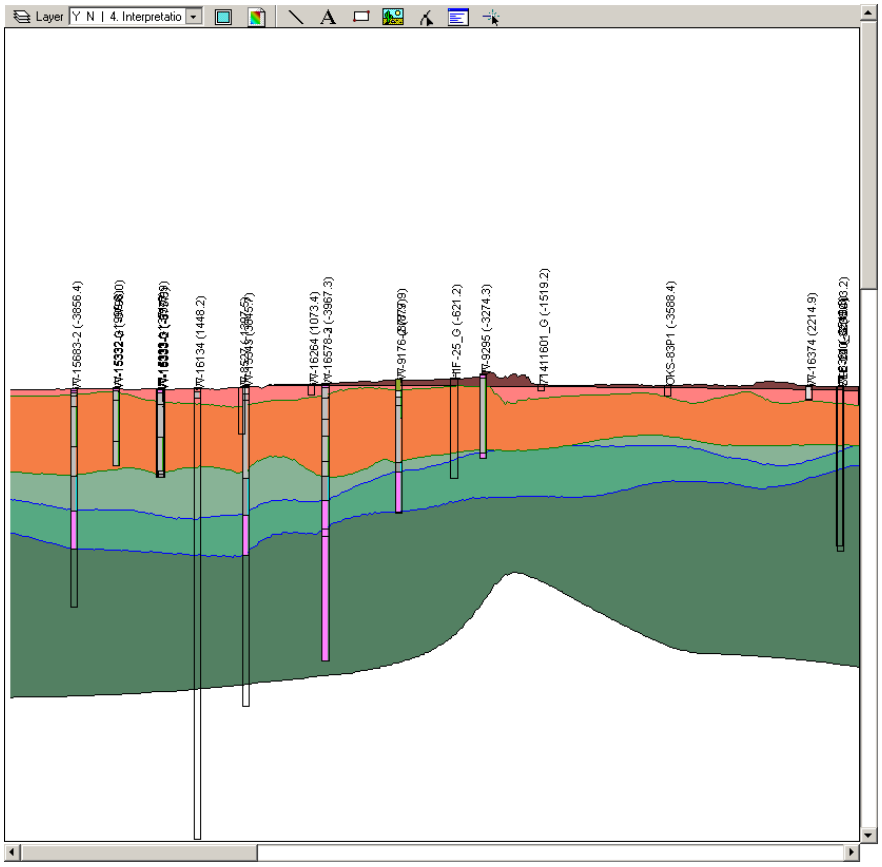
PROCEDURE:

1. Open the Data Parameter menu and activate the Ground Surface Data Parameter, as well as all of the 'Corrected for Section' parameters. Zoom out to view the entire map.
2. In the **List** tab, select the Ground Surface parameter by highlighting it.
3. On the **Section** tab, in the **Surface Pair** drop down menu, select Top of Anastasia – Corrected for Section.
4. Change the **Fill Color** to brown. This will fill the area between the Ground Surface line and the Top of Anastasia line with the color brown.
5. From the **Parameter Number** pull-down menu at the top of the Data Parameter menu, select the Top of Anastasia – Corrected for Section.
6. In the **Section** tab, check on **Show Line**.
7. On the **Surface Pair** drop down menu, select Top of Hawthorn – Corrected for Section (the next layer below the Top of Anastasia – Corrected for Section).

8. For the **Litho Symbol** Select 6 (Anastasia Lithology Code).
9. Continue through all the formations, by pairing each section Parameter with the one below, as shown below

Top	Bottom	Litho Symbol
Top of Anastasia – Corrected for Section	Top of Hawthorn – Corrected for Section	Anastasia Formation
Top of Hawthorn – Corrected for Section	Top of Suwannee – Corrected for Section	Hawthorn Group
Top of Suwannee – Corrected for Section	Top of Ocala – Corrected for Section	Suwannee Limestone
Top of Ocala – Corrected for Section	Top of Avon – Corrected for Section	Ocala
Top of Avon – Corrected for Section	Top of Oldsmar – Corrected for Section	Avon Park Formation

10. Your new figure should resemble the following:



Cross Section with Parameter Pairing.

11. Save your cross section as C:\VL Tutorial\GeoModelTutorial\Section.map

Registering a Cross Section(s)

It is important to remember to register your base map(s) and cross sections in the Project Manager.

TASK: Register the cross section.

PROCEDURE:

1. Make sure that the C:\VL Tutorial\GeoModelTutorial\Section.map that you created in the previous tutorial is still open.
2. Select **Project Data/**Project Manager.
3. Select the icon and select **Register Cross Section(s)**.
4. Select C:\VL Tutorial\GeoModelTutorial\Section.map and select **Open**.

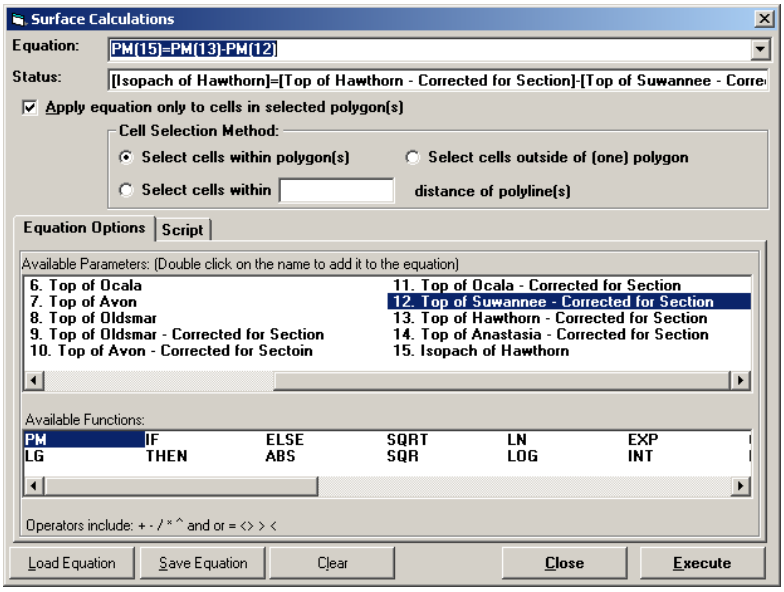
Creating an Isopach Map

In this task, we will examine another use of the Parameter Calculator. Specifically, we will take the difference in elevation between two geologic surfaces to create a parameter that contains the thickness of a unit. This is referred to as an isopach map.

TASK: Generate an isopach map of the Hawthorn unit.

PROCEDURE:

1. Return to your base map (Basemap.map). Open the Data Parameter window and from the **List** tab, click off (deactivate) all of the selected parameters.
2. Select Top of Hawthorn – Corrected for Section.
3. Select **Create**, select **Yes** to replicate all current settings and **No** to append the new parameter to the end of the list.
4. Turn off (deactivate) the Top of Hawthorn – Corrected for Section parameter, and activate the new parameter (at the bottom of the list).
5. On the **Name** tab, rename this new parameter Isopach of Hawthorn.
6. On the **Grid** tab change the **File** to Isopach of Hawthorn.grd
7. Click on **Apply**, and close the Data Parameter window.
8. Turn on the **Layer** menu and make sure the Clipping Bounds layer is visible.
9. Select the polygon that we used previously. You can select this object by using the icon, or by selecting **Edit/Advanced Select/**Select Layer, and placing a check beside the Clipping Bounds and polylines layer.
10. Choose **Tools/**Parameter Calculator.
11. Choose **Apply equation only to cells in selected polygon(s)** and click **Select cells within polygon(s)**
12. Complete the Parameter Calculator window as follows:


Surface Calculations
Equation:
PM(15)=PM(13)-PM(12)
Status:
[Isopach of Hawthorn]=[Top of Hawthorn - Corrected for Section]-[Top of Suwannee - Corre
Apply equation only to cells in selected polygon(s)
Cell Selection Method:
Select cells within polygon(s)
Select cells outside of (one) polygon
Select cells within
distance of polyline(s)
Equation Options
Script
Available Parameters: (Double click on the name to add it to the equation)
6. Top of Ocala
7. Top of Avon
8. Top of Oldsmar
9. Top of Oldsmar - Corrected for Section
10. Top of Avon - Corrected for Sectoin
11. Top of Ocala - Corrected for Section
12. Top of Suwannee - Corrected for Section
13. Top of Hawthorn - Corrected for Section
14. Top of Anastasia - Corrected for Section
15. Isopach of Hawthorn
Available Functions:
PM IF ELSE SQRT LN EXP
LG THEN ABS SQR LOG INT
Operators include: + - / * ^ and or = <> > <
Load Equation
Save Equation
Clear
Close
Execute

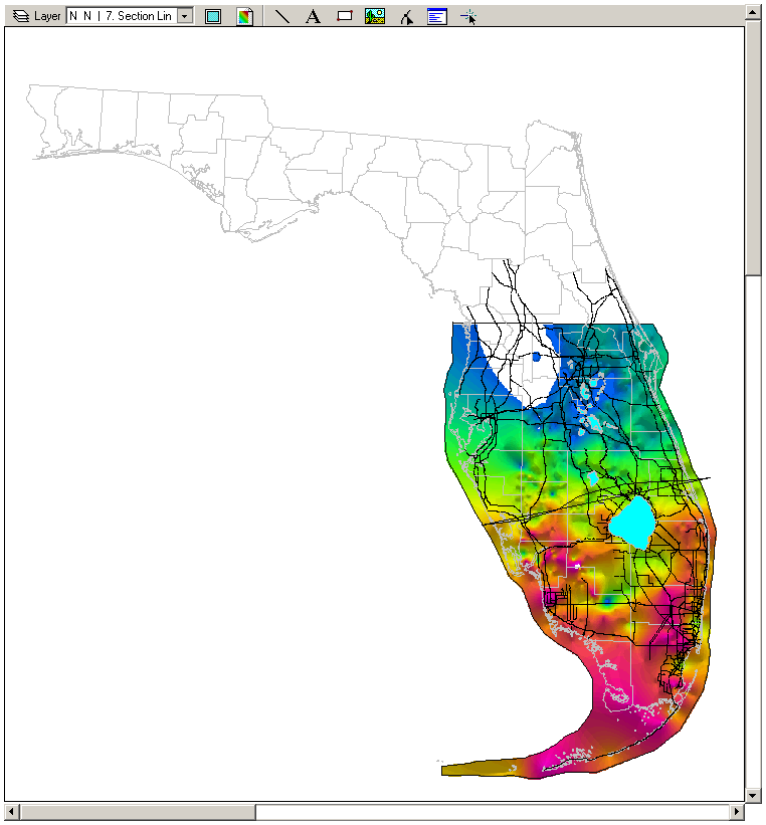
Parameter Calculator for Isopach Calculation.

Equation: PM(15)=PM(13)-PM(12)

Status: [Isopach of Hawthorn]=[Top of Hawthorn - Corrected for Section]-[Top of Suwannee - Corrected for Section]

> **Note:** Your parameter numbers may not exactly coincide with those shown here. When typing in the equation, you can use both keyboard entries and double-clicks on the desired parameter from the list of available parameters.

13. Click **Execute**. Make sure the new parameter you just created is activated. On the **Plan View** tab set the **Contour Start** to 0.001 and **Stop** at 1000. Make sure the **Color Palette** is set to **Blue-Red Spectrum**.



Isopach Map of the Hawthorn Unit.

Lesson 7: Using MS-EXCEL for Data Sources and Parameters

In the previous two Lessons, we went through the steps to set up Data Sources and Data Parameters, with connection to a database in MS-ACCESS. VIEWLOG is also capable of connecting to geologic data from a spreadsheet, such as MS-EXCEL.

For this lesson, we have already created an EXCEL spreadsheet with data. The file C:\VL Tutorial\ GeoModelTutorial\GeologicModellingTutorial-XLdata.xls contains two worksheets: (1) XLlocations, which contains borehole locations and depths, and (2) TopofAnastasia, which contains boreholes, which contain elevations of the top of the Anastasia formation, as shown below:

GeologicModellingTutorial-XLdata.xls

	A	B	C	D	E	F	G	H	I	J	K	L
1	LOC_NAM	LOC_ID	LOC_COO	LOC_COO	BH_GND_	BH_BOTT	FEATURE	FEATURE	FEATURE_CODE			
2	83512107	1	539191.7	1548097	89.5							
3	83512302_	2	528582.8	1547929	88	-657						
4	83512303_	3	532068.9	1550847	96.6	-279.4						
5	83512803_	4	503537.7	1549233	87.63	-212.37						
6	83611001_	5	599547.5	1551495	58.1	-141.9						
7	83612101	6	542768.5	1551823	96							
8	83612604_	7	516490.6	1556657	88.5	-276.5						
9	83612801_	8	503478.7	1556808	66	-235						
10	83612803_	9	503298.1	1556202	100	-265						
11	83712203_	10	534140.3	1557506	96.8	-274.2						
12	83712704_	11	508572.1	1560222	100	-300						
13	83812201_	12	533718.2	1564880	73.4	-300.6						
14	83813204_	13	480074.9	1564786	102	-1098						
15	83312601	14	515255	1535654	91.8							
16	83313001_	15	495004.4	1533815	87.06	-362.94						
17	83313702_	16	454341.4	1535117	120.99	-29.01						
18	83411301_	17	583034.6	1539606	56.8	-377.2						
19	83411901_	18	550587.1	1542611	92	-283						
20	834119	19	549329.1	1539079	117							
21	83412002_	20	546309	1543128	116.67	-1183.33						
22	83412305	21	531960.5	1544888	102							
23	83413302_	22	478449.8	1540957	122.52	-377.48						
24	83510703_	23	618621.1	1549957	59	-441						
25	83511802_	24	558718.9	1549861	91	-1259						
26	83512107_	25	539191.7	1548097	89.48	-282.52						
27	83205801_	26	663818.8	1528125	14.16	-185.84						
28	83210101_	27	650618.5	1526811	51	-234						
29	83210102_	28	650440.3	1527922	44	-116						
30	83210502_	29	626629.4	1531670	63.49	-11.51						
31	83210503_	30	626629.4	1531670	63.14	48.14						
32	83212121	31	542523.3	1529201	102							
33	83212216	32	534227.2	1528722	105							
34	83212225	33	533609.9	1530945	109.3							
35	83212802_	34	503292	1532266	74	67						
36	83312011_	35	544957.7	1538284	110.96	-367.04						
37	83312216	36	536306.2	1537603	79.3							
38	83312312	37	531131.5	1536710	78							

XLlocations | TopofAnastasia

MS-EXCEL File Containing Geologic Data.

Note: Although VIEWLOG can connect to either a database (e.g., MS-ACCESS) or a spreadsheet (e.g., EXCEL), we recommend that a database be used because of the querying capabilities of a database.

Creating a Data Source that is connected to EXCEL

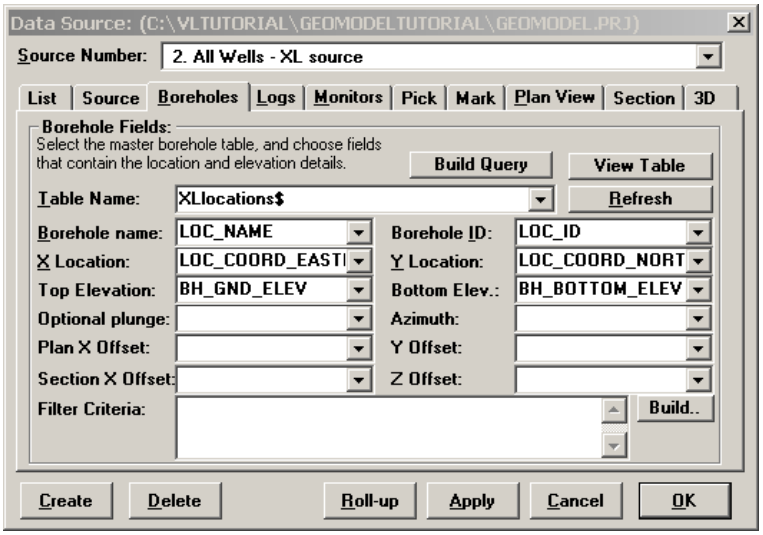
In this Lesson, we will set up a new Data Source that will be connected to an EXCEL spreadsheet.

> **Note:** Make sure the tutorial file in EXCEL is closed when you are running VIEWLOG.

TASK: Create a Data Source and connect it to MS-EXCEL.

PROCEDURE:

1. Open the Data Source menu by using the **F11** key, or clicking on the icon.
2. On the **List** tab, highlight the All Wells Data Source that we created previously.
3. Click on the **Create** button to create a new Data Source. Click on **Yes** to copy the Data Source, and click **Yes** again to add the new Data Source immediately below the existing one.
4. Uncheck the old Data Source, and check on and highlight the new Data Source.
5. In the **Source** tab, change the **Source Name** of this new Data Source to "All Wells – XL source", and click the **Select…** button to change the **DB file name** to: C:\VL Tutorial\ GeoModelTutorial\GeologicModellingTutorial-XLdata.xls
6. In the **Boreholes** tab, set the **Table Name** to XLlocations$, and fill out the rest of the table as shown below:



The Boreholes Tab for a Data Source Connected to EXCEL.

7. Click on **Apply**, and **OK** to close the Data Source window.

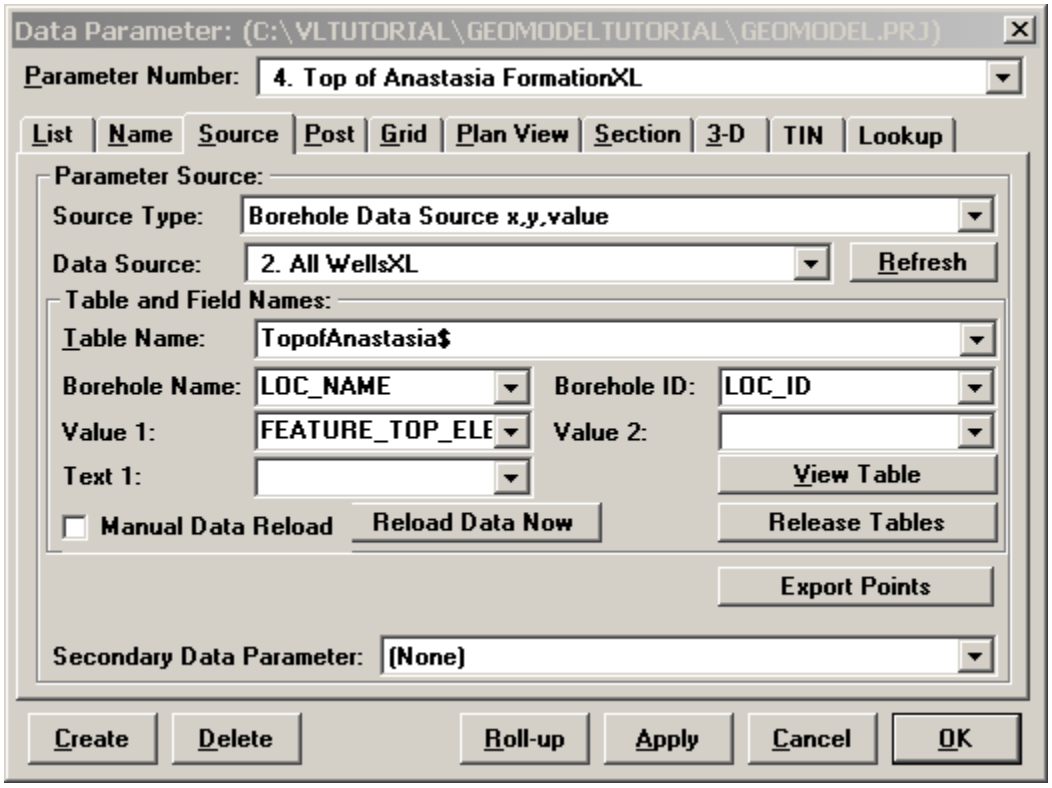
Creating a Data Parameter that is connected to EXCEL

The next step is to set up a Data Parameter for one geologic surface (Top of Anastasia).

TASK: Create a Data Parameter and connect it to MS-EXCEL.

PROCEDURE:

1. Open the Data Parameter menu by hitting the **F12** key or clicking on the icon.
2. On the **List** tab, highlight the Top of Anastasia Formation Data Parameter that we created previously.
3. Click on the **Create** button to create a new Data Parameter. Click on **Yes** to copy the Data Parameter, and click **Yes** again to add the new Data Parameter immediately below the existing one.
4. Uncheck the old Data Parameter, and check on and highlight the new Data Parameter.
5. In the **Name** tab, change the **Name** to Top of Anastasia Formation – XL source.
6. Fill out the **Source** tab, as shown in the following figure:



The Source Tab for a Data Parameter Connected to EXCEL.

7. In the **Grid** tab, change the File to C:\VL TUTORIAL\GEOMODELTUTORIAL\TOP OF ANASTASIA XL.GRD, and click on **Krige**.
8. You have now created a new surface to represent the top of the Anastasia formation, as we did in the previous tutorial.

Lesson 8: Advanced Mapping Options

VIEWLOG contains many advance mapping options, some of which are described in this lesson.

Section Picking

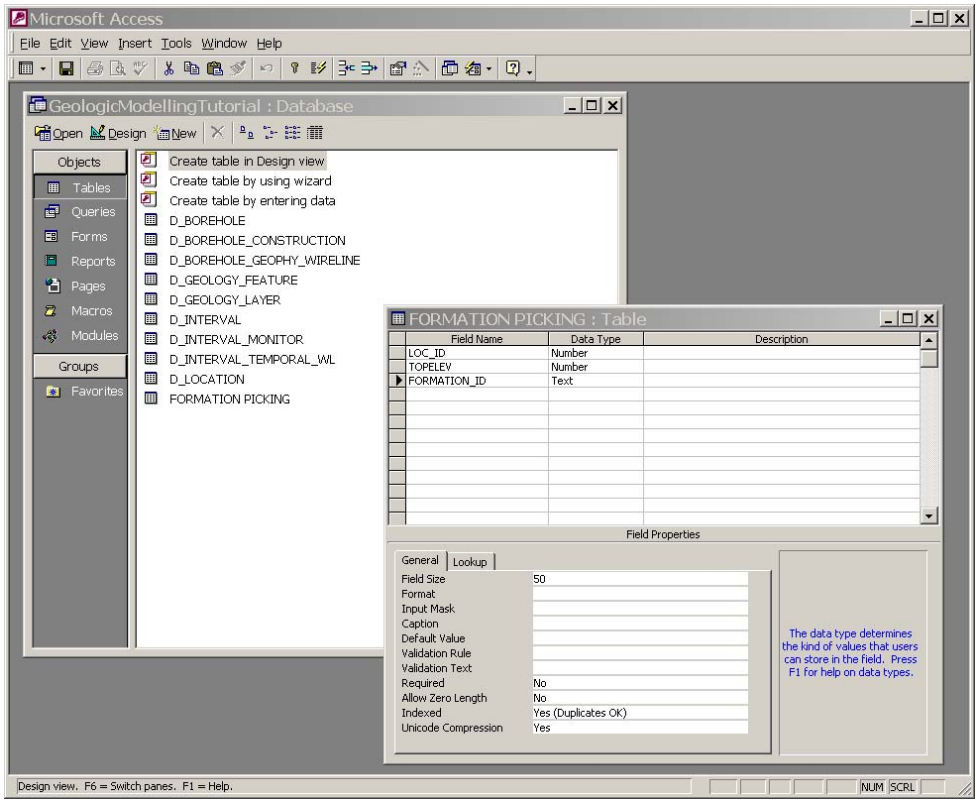
Periodically, when creating cross sections, the picks for the tops of Formations are either incorrect or non-existent. VIEWLOG provides the ability to hand pick these points and write them back to the database.

TASK: To hand-pick the top of Hawthorn Group for defined wells.

PROCEDURE:

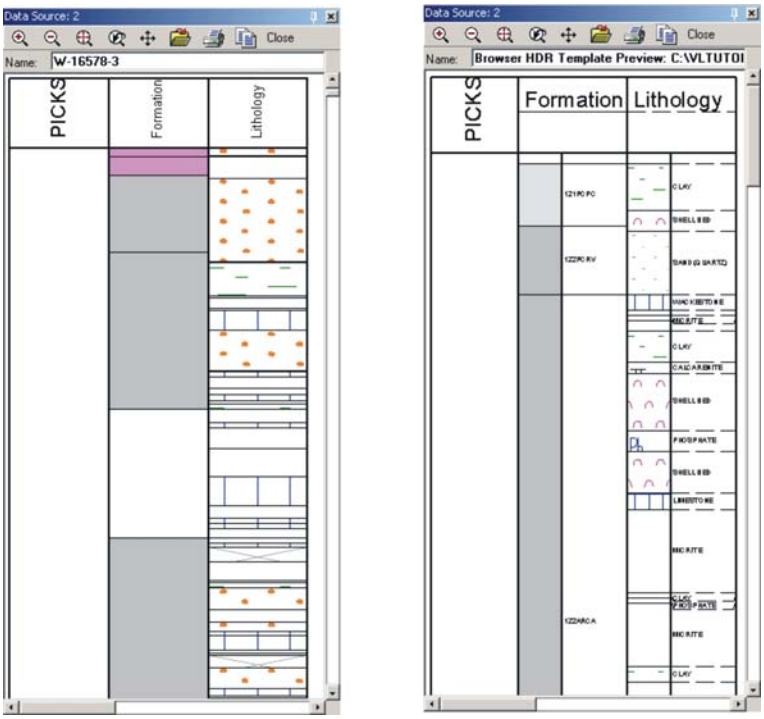
1. Create a new table in the database. This table only needs to have a three fields; Well_ID, TOPELEV and FORMATION_ID. In the Data Type column, make sure WELL_ID is set as a number (Long Integer), TOPELEV is a number (Single), and FORMATION_ID is set as Text.
2. Save this table as VL_FORMATION PICKING.

> **Note:** The GeologicModellingTutorial.mdb database includes a copy of this table already, called FORMATION PICKING.

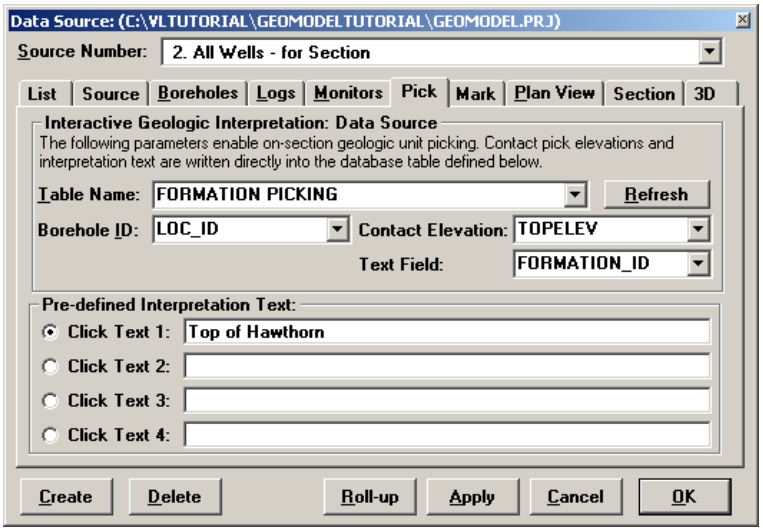


Creating a New Table in MS-ACCESS for Section Picking.

3. Open the cross section from the previous tutorial. C:\VL Tutorial\GeoModelTutorial\Section.map.
4. Choose **View/**Cross Section Setup and change the **Vertical Exaggeration** to 50.
5. Open the Data Source menu and activate the All Wells Data Source. Click **Create** and duplicate the Data Source. Click **Yes** to replicate the current Data Source, and **No** to append the new source to the bottom of the list. Make sure that the activated Data Source is on the borehole layer and the Boreholes layer is the current layer.
6. Now deactivate (unselect) the All Wells Data Source and activate the new copy that you just made.
7. One the **Source** tab, rename the new source All Wells – for Section.
8. On the **Logs** tab, we will use a different Default template HDR file that has a column for the picks, and in the Alternate Data Source Browser Template HDR file we will use the same template, but with some text attached. C:\VL Tutorial\GeoModelTutorial\All Columns_Template_Picking_Section.hdr for the default template header and C:\VL Tutorial\GeoModelTutorial\All Columns _Template_Picking_Section with Text.hdr for the alternate template header.



9. Default and Alternate Template HDR Files for Picking.
10. Open the **Pick** tab from the Data Source window. In the **Table Name** box, insert the new FORMATION PICKING table you just created in MS-ACCESS. Click on the **Refresh** button. The remaining fields should automatically be displayed. In the **Pre-defined Interpretation Text** menu, type in Top of Hawthorn.



11. The Pick Tab in the Data Source Window.

12. Choose **Tools/**Show Pick Options Menu. This menu will show all the lithology symbols as defined in the Lithology Symbol Editor. At the top of the menu under the (prompt for user input) will be the predefined Formation ID we set above (i.e., Top of Hawthorn).

Note: Predefining an interpretation text is an option which simplifies the picking process. By not predefining an interpretation, you have the ability from the **Pick Options** menu to select the appropriate lithology to which the pick will be associated. For example, if you are unsure of the formation top that you are picking and wish to identify the uncertainty in that pick, in the predefined interpretation text field you can enter "Top of Hawthorn – uncertain pick". This text will then appear in the database associated with the LOC_ID and depth. This adds flexibility when isolating or flagging new picks.

13. To begin the picking process, select **Tools/**Pick Geology on Section. On the main menu, under the icon display the status line will display: PICK GEOLOGY: SELECT a borehole, then left click to add a contact, right click to remove. Before you begin to pick, activate the Data Source browser window, by choosing **Tools/**Show Source Browser Window.

Note: From the **Pick Options** menu you also have the ability to highlight more than one lithology type. For example if the formation was described or interpreted as 37/36, you can then highlight both options and this would appear in the Formation_ID field in the table, with the appropriate WELL_ID and depth.

14. Upon selecting a well, the Data Source browser window will automatically update with the pick elevation. Each time you make a pick, that information is directly added to the database (in the FORMATION PICKING table we previously created).

Note: As you make the picks on section by left clicking the mouse, a blue line will temporarily appear on the section, this line will disappear on section once you move to select a new well. This is why it is important to have the Data

Source Browser open when you do the picking so that you can monitor the progress.

15. Once you have completed the picking process, you can create a new Data Parameter with this FORMATION PICKING data. The Top of Hawthorn can be re-kriged with this Pick Data Parameter as the Secondary Data Parameter. The next task includes an example on the use of a Secondary Data Parameter.

Hand Contouring on Section

There are two methods available for hand contouring data, either in section view or in plan view. The following exercises outline examples of how each method works. For simplicity, we have chosen the Top Hawthorn as the demonstration example.

In some instances, after generating surfaces for the tops of formations or aquifers, the user may wish to make minor adjustments to the morphology of that surface, particularly where there are no boreholes to constrain the area. An extreme example would be a buried valley. In following example, we will assume that a portion of the Hawthorn Group occurs at a lower elevation than the kriged surface (derived for the borehole information).

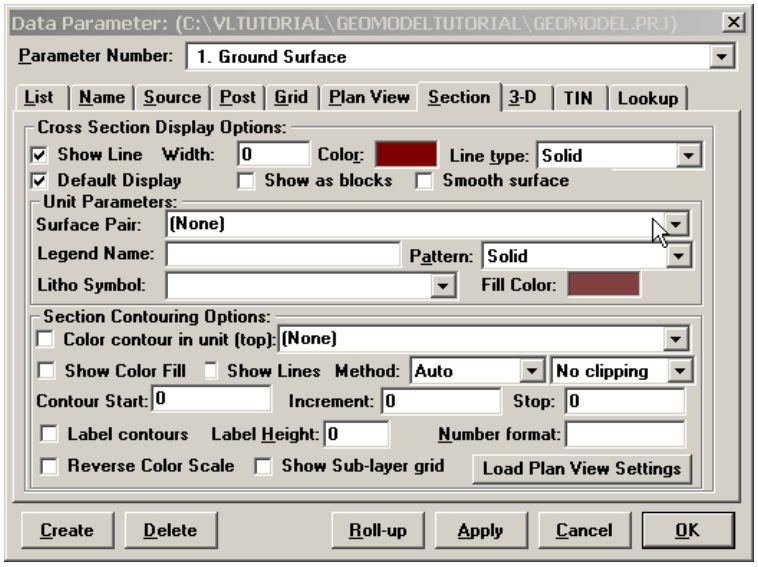
TASK: Hand contouring on section.

PROCEDURE:

1. Open C:\VL Tutorial\GeoModelTutorial\Section.map. Choose **View/**Cross Section Setup and change the **Vertical Exaggeration** to 300.
2. Open the Data Source menu and activate the All Wells Data Source on the **List** tab. Deactivate the All Wells – for Section Data Source.
3. Unclick all the parameters except Ground Surface and the Top of Hawthorn - Corrected Section. From the **Section** tab unpair both of the surfaces, so that what is visible on section are just the lines representing the top of the surface.

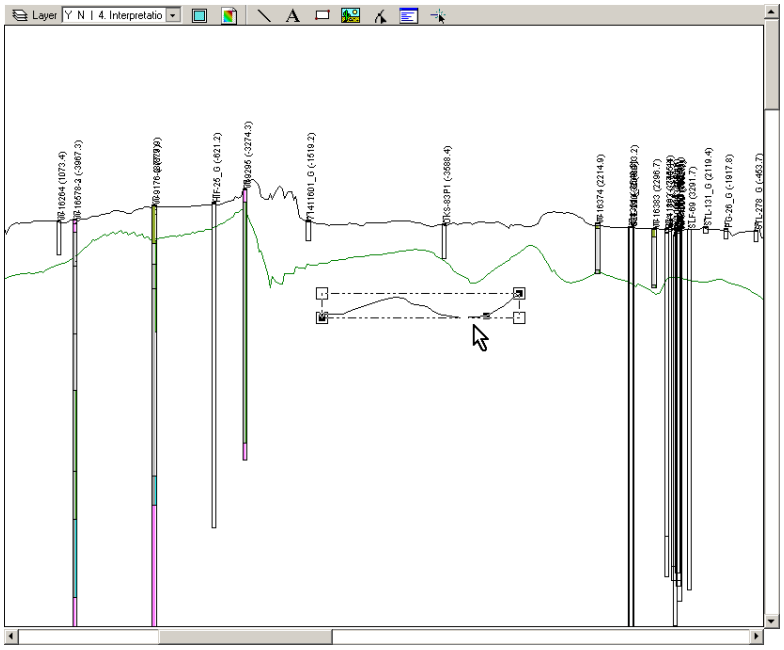
Note: You may at this point wish to replicate the parameter Top of Hawthorn – Corrected for Section such that you do not lose the previous work that you have accomplished. Call the new parameter Top of Hawthorn - Section Contouring. This additional step is highly recommended. Once you are familiar with the procedures and are confident in you own interpretations, this step is not necessary.

4. In the **Section** tab, turn off the **Surface Pair** for both the Ground Surface, and the new parameter Top of Hawthorn – Section Contouring (see below).



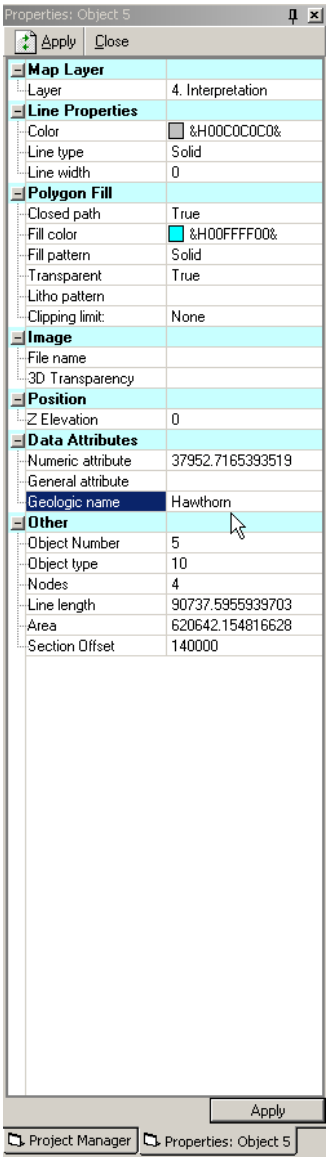
Turning off the Surface Pairs.

5. Choose the drawing tool icon and draw a polyline under surface of the Hawthorn Group, as shown below.



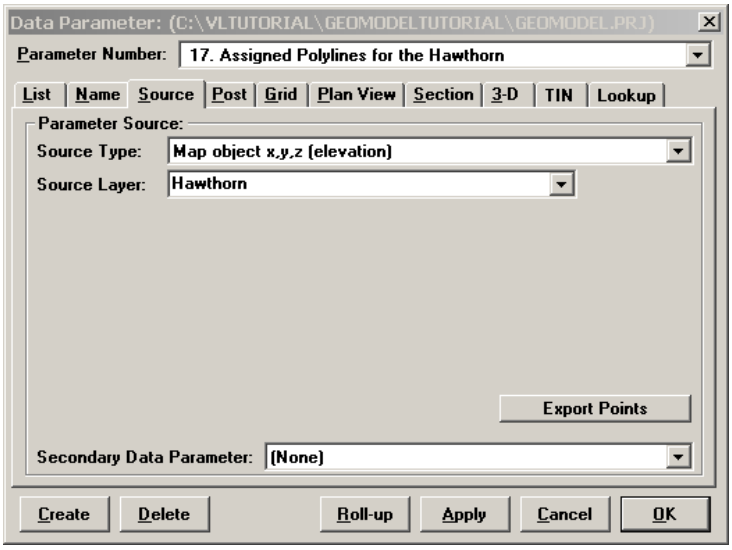
Drawing a Polyline on Section for Contouring.

6. Make sure the polyline you just drew is selected (you'll see a box around the line, if it's selected). Choose the icon to view the **Attributes** window. In the **Geologic Name** box, type "Hawthorn" (see below). Click on **Apply** at the bottom of the window. This will assign a name to this polyline.



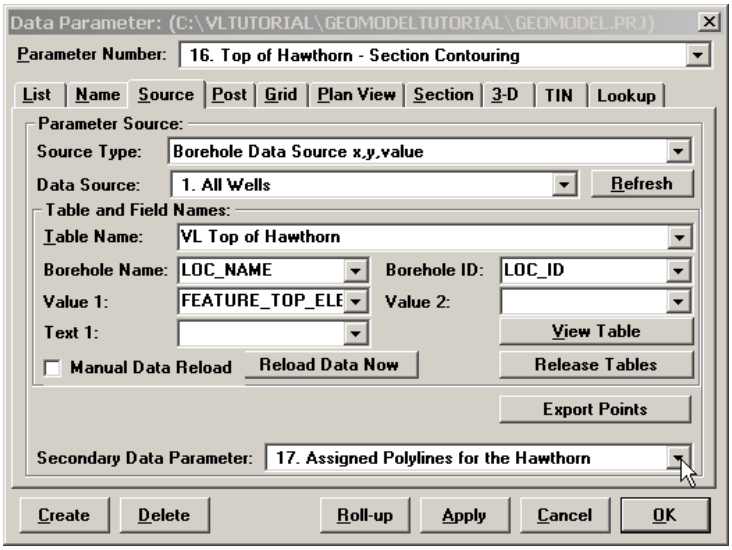
The Attributes Window.

7. Open the Data Parameter menu and click **Create**. Do not replicate the current parameters.
8. On the **Name** tab call the new parameter Assigned Polylines for the Hawthorn.
9. On the **Source** tab, for the **Source Type** choose Named Map Object x,y,z (elevation) and make the **Geoname** “Hawthorn”. This will assign all polylines named “Hawthorn” to this new Data Parameter (see below).


Data Parameter: (C:\VLTUTORIAL\GEOMODELTUTORIAL\GEOMODEL.PRJ)
Parameter Number: 17. Assigned Polylines for the Hawthorn
List Name Source Post Grid Plan View Section 3-D TIN Lookup
Parameter Source:
Source Type: Map object x,y,z (elevation)
Source Layer: Hawthorn
Export Points
Secondary Data Parameter: (None)
Create Delete Roll-up Apply Cancel OK

Assigning a Geoname to a Data Parameter.

10. Activate the Data Parameter (highlight and check on) Top of Hawthorn – Section Contouring. On the **Source** tab, select Assigned Polylines for Hawthorn as the **Secondary Data Parameter** (see below).

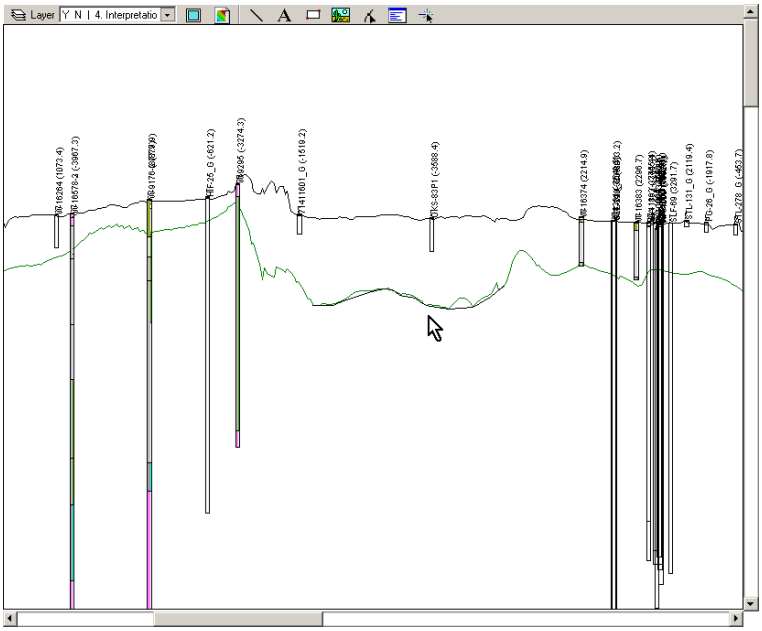

Data Parameter: (C:\VLTUTORIAL\GEOMODELTUTORIAL\GEOMODEL.PRJ)
Parameter Number: 16. Top of Hawthorn - Section Contouring
List Name Source Post Grid Plan View Section 3-D TIN Lookup
Parameter Source:
Source Type: Borehole Data Source x,y,value
Data Source: 1. All Wells
Refresh
Table and Field Names:
Table Name: VL Top of Hawthorn
Borehole Name: LOC_NAME
Borehole ID: LOC_ID
Value 1: FEATURE_TOP_ELE
Value 2:
Text 1:
View Table
Manual Data Reload
Reload Data Now
Release Tables
Export Points
Secondary Data Parameter: 17. Assigned Polylines for the Hawthorn
Create Delete Roll-up Apply Cancel OK

Assigning a Secondary Data Parameter.

11. Select the **Grid** tab and rename the grid file Top of Hawthorn section contouring.grd. This is to prevent over-writing the original section that we have previously made. For the purpose of the tutorial, it is wise to protect each step so that the user may revisit any previous examples.

12. Click **Krige** and then **Apply.** You show see that the new surface has been kriged to match the polyline as best as possible, as shown in the figure below.

Note: This procedure can be done with any number of polylines as long as they are defined in the attribute menu by a name.



Contouring in Cross Section with Polylines Added as a Secondary Parameter.

Hand Contouring in Plan View

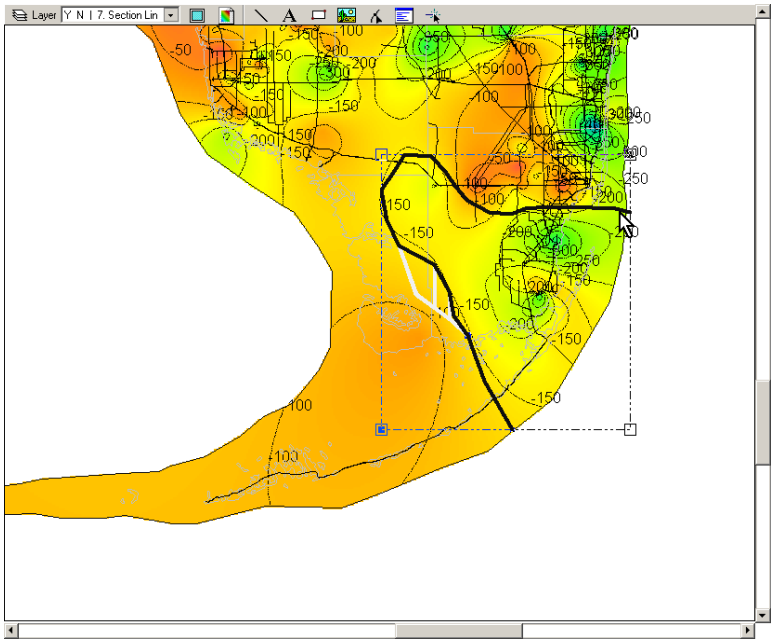
The methodology for hand contouring in Plan View is much the same as with section view. It is strongly recommended to create new layers for the polylines that will be defined.

TASK: Hand contouring the top of Hawthorn Group.

PROCEDURE:

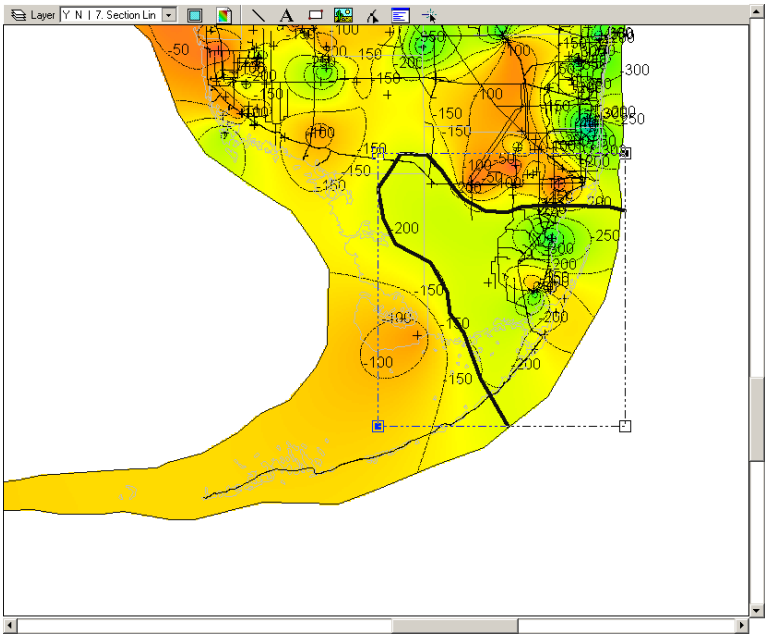
1. Open the Data Parameter menu, activate the Top of Hawthorn – Corrected for Section parameter. In the **Plan View** tab, set the **Contour Start** to –600 and the **Stop** to 200, and set the contour **Increment** to 50. Make sure the **Show Lines** and **Label contours** are checked on and the **Label Height** is set to 50.
2. Replicate the Top of Hawthorn – Corrected for Section. In the **List** tab, name the new parameter Top of Hawthorn – Hand Contouring. Deactivate the Top of Hawthorn – Corrected for Section parameter (i.e., uncheck), and activate the new Hand Contouring parameter. Make sure the **Parameter Number** at the top of the Data Parameter window shows your new Hand Contouring parameter.
3. On the **Grid** tab, rename the grid file (as not to overwrite any previous work) Top Hawthorn Hand Contouring.grd.
4. Zoom in on the Florida Keys.
5. Draw a polyline in roughly the same configuration as outlined below.

6. Choose the Attributes icon and assign the name 'Hawthorn' to the polyline, under the Data Attributes/**Geological Name**.
7. Under Position/**Z Elevation** enter -200. By doing this we have assigned the polyline not just an attribute name but also an elevation.



Drawing a Polyline for Hand Contouring in Plan View.

8. From the Data Parameter window on the **Source** tab, choose the **Secondary Data Parameter** as Assigned Polylines for Hawthorn Group
9. On the **Grid** tab, choose **Krige** and then **Apply**.
10. You should notice that the new surface, shown below, includes values of –200 around the polyline. The polyline values have been included in the kriging process.



New Hawthorn Surface with Hand Contouring.

Lesson 9: Working with VIEWLOG Grids

VIEWLOG grids are used to direct the interpolation process. Interpolation consists of two elements: a grid definition, and a file containing the interpolated results at each grid cell.

In the Map Editor, the Project Data Menu is used to define one or more grids. A grid includes information about the position and number of rows and columns in a grid.

The interpolation process is controlled through the Data Parameter menu.

In general, it is good idea to carefully define (and refine) your grid definitions early in the project. Major changes to a grid later in a project may require that each Data Parameter be re-interpolated to a revised grid definition. Re-interpolation is not a difficult task, but can take a lot of processing time.

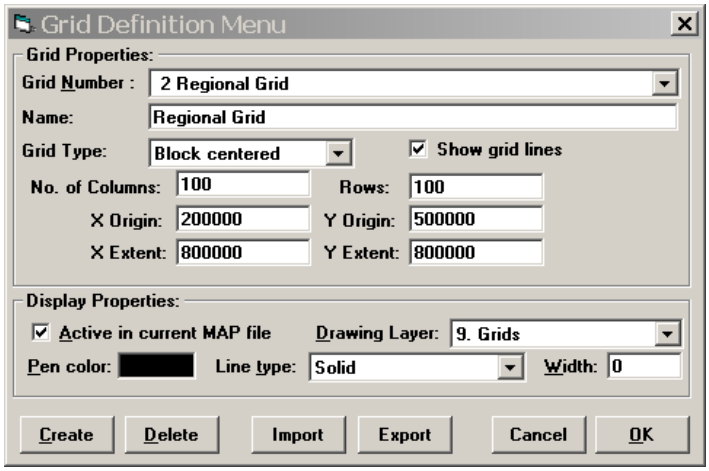
Creating and Displaying Grid Definitions

TASK: Create a new grid.

PROCEDURE:

1. Open your Basemap.map in world coordinates and press **F5** to zoom out until you see the entire state. (Remember that the **Esc** key cancels all current functions)
2. Open the **Project Data/**Grid Properties and click **Create** to create a new grid
3. Enter Regional Grid as the grid **Name**.
4. Fill in the appropriate information, as shown below. Remember the importance of Layer definitions (see Layer Menu).

> **Note:** We recommend that you create a new layer called Grids, and place all new grids on this layer.



The Grid Definition Menu.

5. Click **OK**. You should see a mess of grid lines on your map.
6. Select **Project Data/**Grid Properties and click off **Active in Current Map file** and click **OK**. This turns off the lines in the current map.

7. By choosing **Project Data/**Define New Grid you can interactively define a grid shape by hold the left mouse button down and dragging a box over the desired area.

> **Note:** Grids over 500 rows by 500 columns require a Pentium II or better computer to manage effectively. Start with a coarse grid and use grid refinement to add cells only where needed.

Moving a Grid

TASK: Move a grid.

PROCEDURE:

1. To move a grid, first select **Project Data/**Grid Properties.
2. Redefine the grid X and Y origin in the **Grid Definition Menu**. The grid refinement, and all settings, will be preserved.

Editing and Refining a Grid

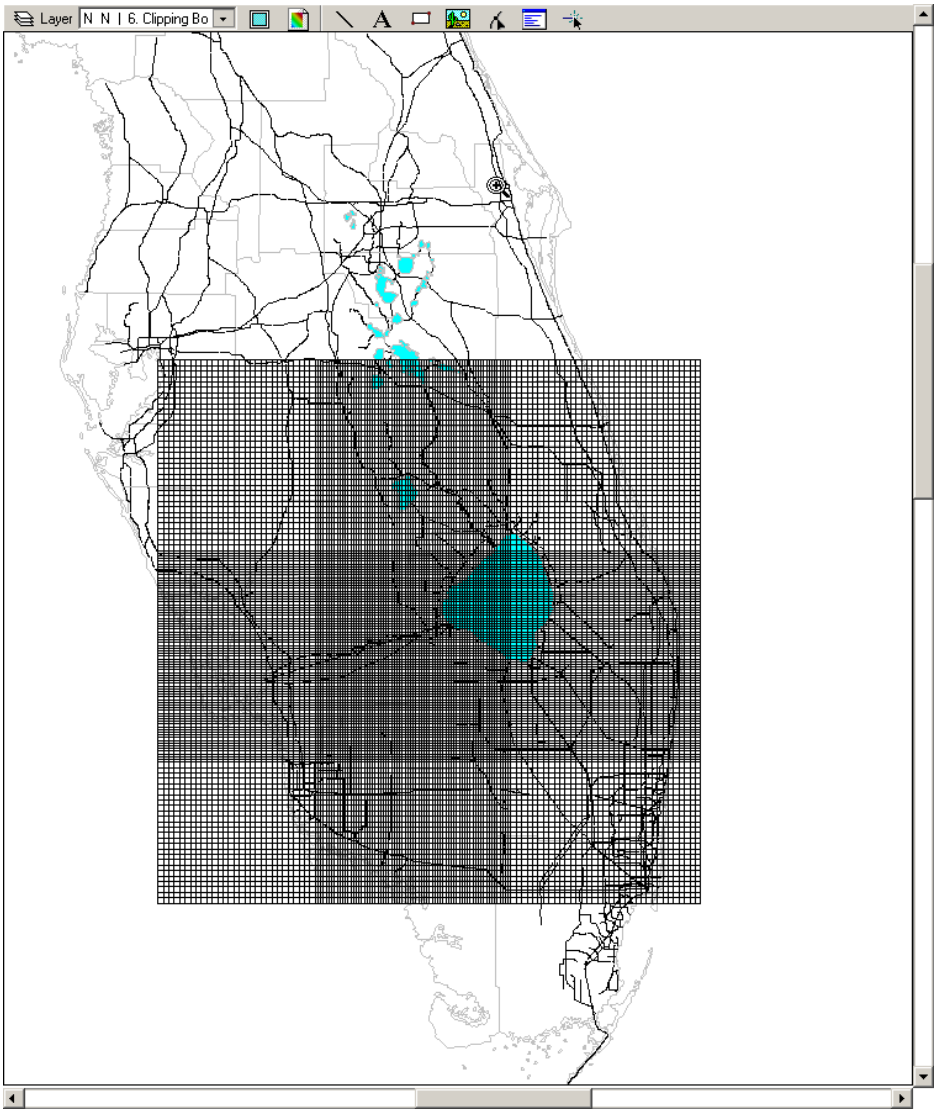
By default, grid definitions have uniform cell sizes. The ability to refine a grid is a very powerful feature, as it allows smaller cell sizes in areas of interest. For example, a grid with large cells could be defined to cover the entire study area, and then cell size can be refined in zones where there are many boreholes. This provides detail only in zones of interest, and provides a seamless transition from the local to the regional scale.

TASK: Refine a grid.

PROCEDURE:

1. Select **Project Data/**Grid Properties and select the Regional grid just created. Activate the Grid on the map by clicking the **Active in current Map file** on.
2. Click **OK**.
3. Select **Project Data/Edit Grid/**Refine Region.
4. Click to define a box in which each cell will be sub-divided.

> **Note:** Use this command carefully, for it can create many cells very quickly.



An Example Grid with Refinement.

5. If you make a mistake simply go back to **Project Data/**Grid Properties, change the number of columns and rows back to 100, and try again.

Note: To turn off the grid (so that it is not visible on your map) Click on **Project Data/**Grid Properties and unselect **Show grid lines** as well as **Active in current MAP file**. This does not delete the grid that you just created; it simply removes it from the current map file.

Lesson 10: Exporting/Importing Grids or Parameters

Periodically the need will arise to export grids files or parameters to clients or partners in projects. There are two ways to accomplish these tasks. Exporting/Importing grid files from the grid tab on the parameter menu is the best method to exchange grids files within a project or to deferent software packages. Exporting/Importing parameters gives the user control in exporting the grid definitions (see Lesson 9), grid files as well as clipping certain sections of larger grid files.

Exporting/Importing Grid Files

Viewlog has the ability to export/import grids files in a variety of formats.

Export:

- ASCII XYZ grid data (*.xyz)
- EVS Geo grid data (*.geo)
- Surfer ASCII Grid data files(*.srg)
- ArcInfo AGR ASCII Grid (*.arg)
- Modflow *E14.6 ASCII grid data (*.dat)

Import Formats:

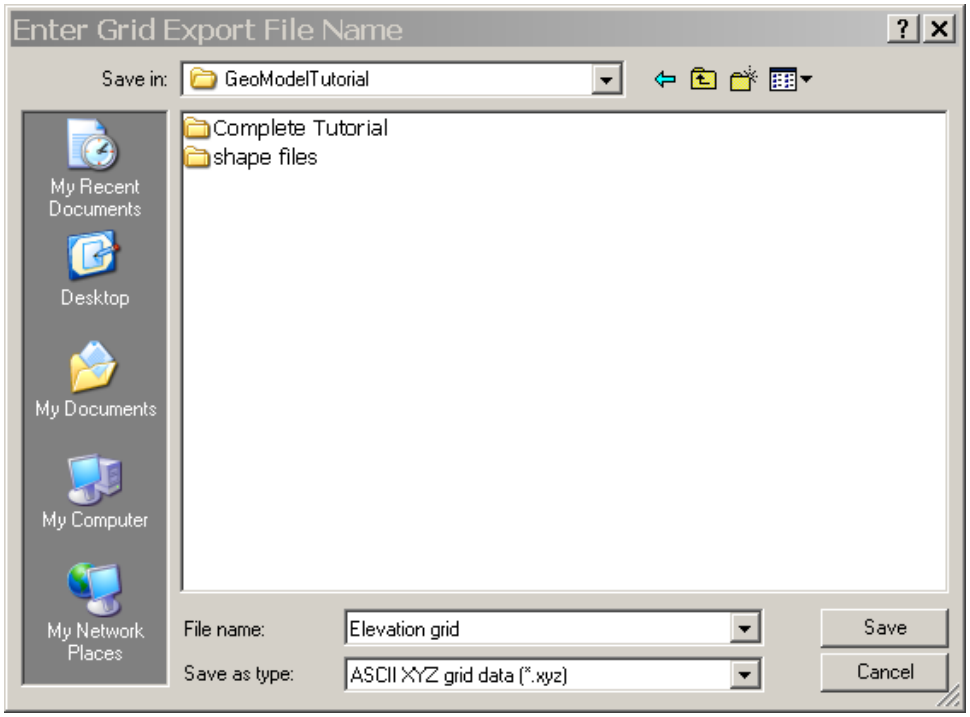
- Surfer ASCII or Binary Grid (*.grd,*.srg)
- ArcInfo AGR ASCII Grid (*.arg, *.asc, *.txt)
- ASCII XYZ grid data (*.xyz)
- Modflow ASCII grid data (*.dat, *.txt)
- ERMapper Binary grid data (*.ers)

> **Note**: An example of how to import a grid file was discussed in Lesson 6 – Working with Data Parameters.

TASK: Export Ground Elevation as an ASCII XYZ grid file.

PROCEDURE:

1. Open the **Data Parameter** menu
2. Activate Ground Surface and choose apply. Make sure that no other surfaces are activated.
3. Choose the **Grid** tab.
4. Choose **Export Gridded Data.** The Enter Grid Export File Name window will appear. BY default the file name will be the grid file associated with the activated parameter. In this case the grid file name is ELEV.grd. The user has the option to change the file name at this point. Type in “Elevation Grid” and choose ASCII XYZ grd data (*.xyz) as the file type. See figure below.
5. Choose **Save**. Viewlog will then prompt you that the new file has been created. Choose **OK**.



Exporting a grid file

Note: Exporting grid files will not export the grid definition files that are needed to display the VIEWLOG grid file. If you with to export the grid definition file along with the VIEWLOG grid file the user must export the entire parameter. See below.

Exporting/Importing Parameters

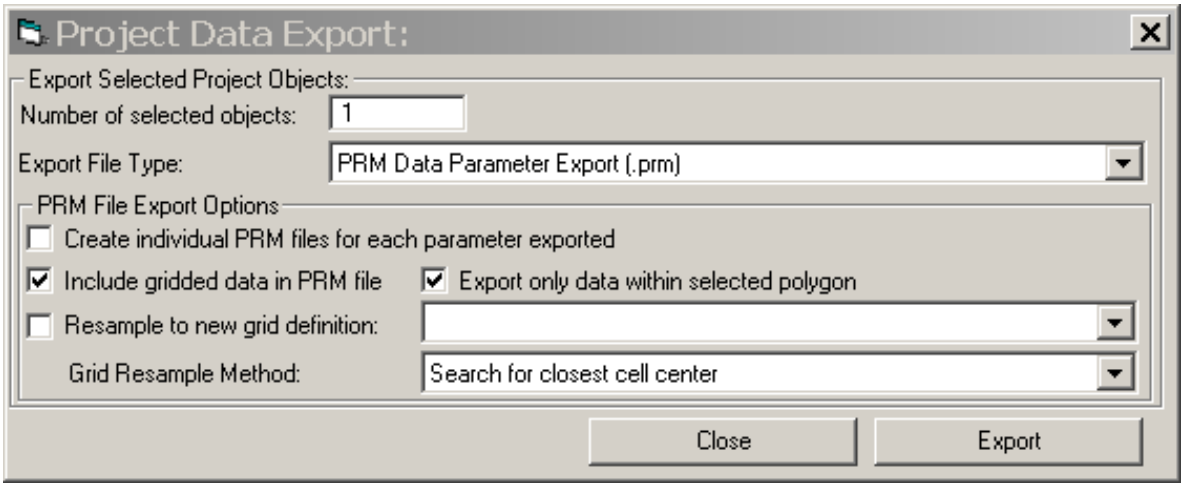
Often the user will be required to export a VIEWLOG grid file. In order to view a VIEWLOG grid file the grid definition file must also be exported. Sometimes, if the project area is quite large the user may wish to export only a portion of the gridded surfaces to give to a client or secondary user. The best method of accomplishing this task is to use the Project Manager.

TASK: Exporting a subsection of the Ground Surface grid.

PROCEDURE:

1. Open the Data Parameter menu.
2. Activate the Ground Surface parameter and click **Apply**. For the purpose of this exercise ***only,*** create a copy the Ground Surface parameter and name it Clipping Ground Surface for Export. Inactivate Ground Surface and make sure that the new parameter is activated.
3. From the main menu chose **Draw/*Box*** and draw a large box around Lake Okeechobee (Lake in Central Florida). This will be the portion of the Ground Surface grid that we will be exporting.
4. Make sure the box you just drew is selected.

5. From the main menu chose **Project Manager** and click on the tools icon, and choose **Export project data**.



Exporting a Data Parameter

6. The **Project Data Export** window will appear. Since we have only selected the Ground Surface Parameter, the Number of selected objects will be 1.
7. Choose **PRM Data Parameter Export** as the Export file type.

> **Note**: There are two other options from this Menu. You may wish to choose **GDF Grid Definition Export**, which allows the user to export only the grid definition or **SRC Data Source Export, which** allows the user to export the data source information.

8. From the PRM File Export Options, select Include gridded data in PRM file as well as Export only data within the selected polygon.

> **Note**: If the user wishes to export more than one grid or surface than activate (turn on) the required parameters. For example if you wish to export the ground surface, Top of Anastasia Formation, Top of Hawthorn and the Top of the Suwannee Limestone, then each of those parameters must be activated on the data parameter menu. You may wish to choose Create individual PRM files for each parameter exported, which will create a PRM file for each surface. By not selecting that option only one PRM file will be created, retaining the individual parameters.

9. Choose **Export**, and select **Yes** for **Export Selected Objects** and name the file "Clipped Ground Surface".
10. Choose **OK**. The user has now created a file that can be given to a client or colleague to view the gridded surfaces of the selected area. The following steps are how to import the PRM files into an existing or new project and do not necessarily need to be completed by the user.
11. Chose **Project Manager** and click on the tools icon, and choose Import project data. Select Clipped Ground Surface.prm and click on **Open**.

12. In the **Parameter Import Options** choose the appropriate directory. Select **Import** and choose **OK**.

Lesson 11: Getting Started in the Log Editor

This lesson is designed to be a step-by-step introduction to the process of editing and adding text interpretation to a suite of geophysical logs. The lesson includes correcting and interpreting data from a recently logged well. This includes adjusting the data presentation, correcting the logs, adding interpretation, and output of the results.

An important advantage of working with digital log data is the ease at which the data may be duplicated, and it is recommended that original data files be duplicated at the earliest stage. Retaining the original unedited files allows complete re-interpretation later. Backing up to a floppy disk, for storage in a safe place, is highly recommended.

Opening the Log Tutorial File

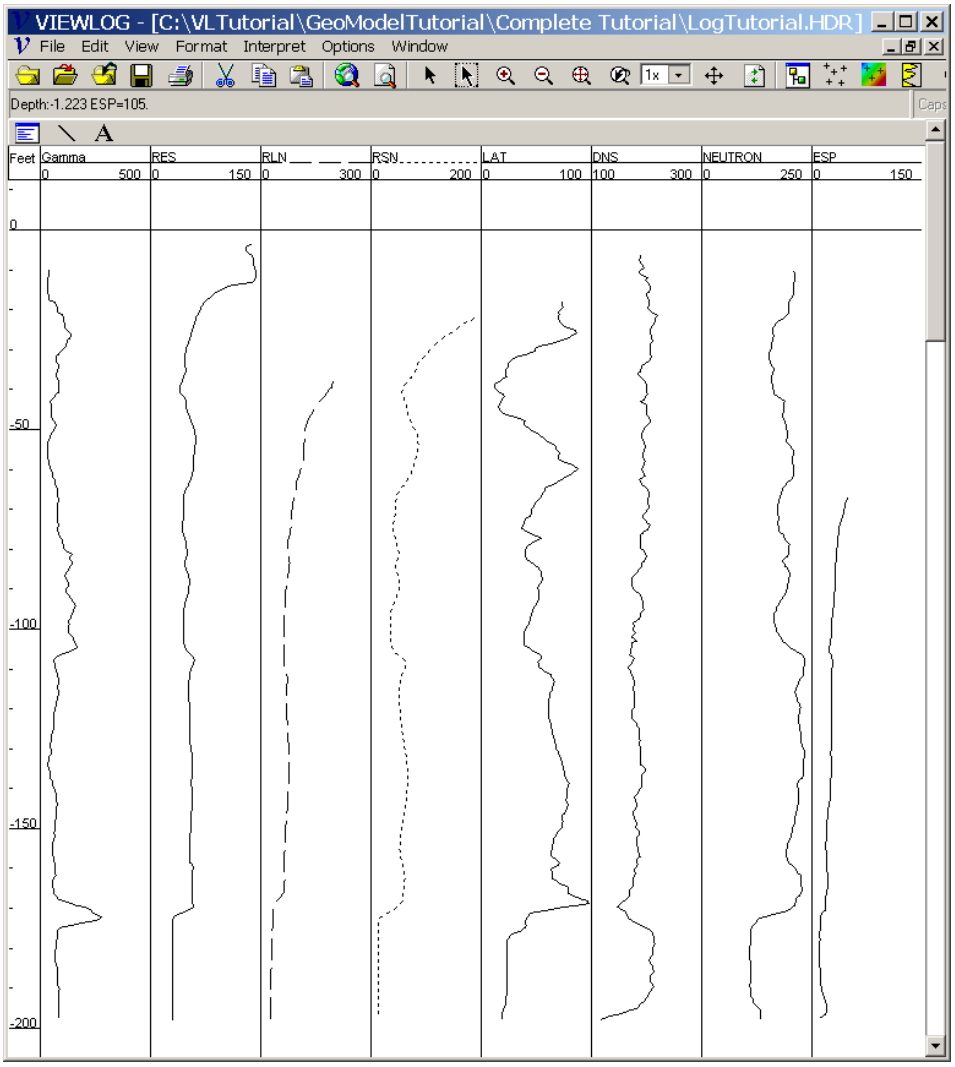
TASK: Open the Log Tutorial file.

PROCEDURE:

1. Start VIEWLOG and select **File/**Open Log File. By default, the **File Open** window displays a list of VIEWLOG HDR well data files.
2. To load the tutorial file, first change to the C:\VL Tutorial\GeoModelTutorial\ directory by double clicking on the directory name in the directories list box. Select the file "LogTutorial.hdr", then click **OK** to load the file.

> **Note:** During your HDR file editing session, it is important to note that any changes and interpretations are made only to data retained in the computer's memory. No changes will be saved until the program is directed to do so, allowing changes to be abandoned by exiting without saving the file. When log-editing changes are saved, all related parameters are written to disk, including editing changes, interpretation, and the configuration of the log display.

3. After opening the LogTutorial.hdr file, the program will enter the Log Editor (see below).



The Log Editor.

Note: Because scale values are only provided at the left and right edges of the log columns, the elevation (or depth) and log value of the tip of the mouse cursor are continually updated on the button bar line (top left hand corner of screen). Note that depth is displayed with a minus sign. Pressing the left mouse button will display a horizontal and vertical reference line at the tip of the cursor.

Changing the Thickness of Data Displayed

The thickness presented on the screen can be changed using a number of functions available in the **View** menu. Increasing the thickness allows review of the entire well, while reducing the thickness improves the accuracy of mouse movement and interpretation.

TASK: Change the thickness of data displayed to 50 feet.

PROCEDURE:

1. Select **View/**Thickness.
2. Enter the new thickness of 50 and click on **OK**.
3. The screen will redraw, showing the new thickness.

Using the Zoom Functions in the Log Editor

The **View/**Thickness option is only one of a number of methods to change the vertical depth scaling found in the **View** menu.

TASK: Change the screen to display the data between 20 and 40 feet, interactively, with the mouse.

PROCEDURE:

1. Select **View/**Zoom In (Shortcut **F4**). Notice how the status line now displays **Press and drag the mouse to define a ZOOM WINDOW...**
2. Move the mouse to Elevation = -20, and place the cursor in the Gamma log column.
3. Press (and hold) the left button and drag the mouse down and to the right, until the elevation reads approximately -40 feet. A rectangle will form on the screen, showing the size of the zoom window.

> **Note:** The only the vertical size of the window is used, and that the scaling of the Gamma log is not affected by the width of the zoom box.

Release the mouse button to redraw the screen.

Select **Edit/**Cancel Current Function or press **F3** to cancel the Zoom function.

> **Note:** The same zoom procedure can also be performed with the right mouse button at any time (except if the right mouse button is in use for another function, such as removing contact lines).

Changing the Log Scales

There are two windows, accessed from the **Format** menu, which can be used to control log scaling. These include:

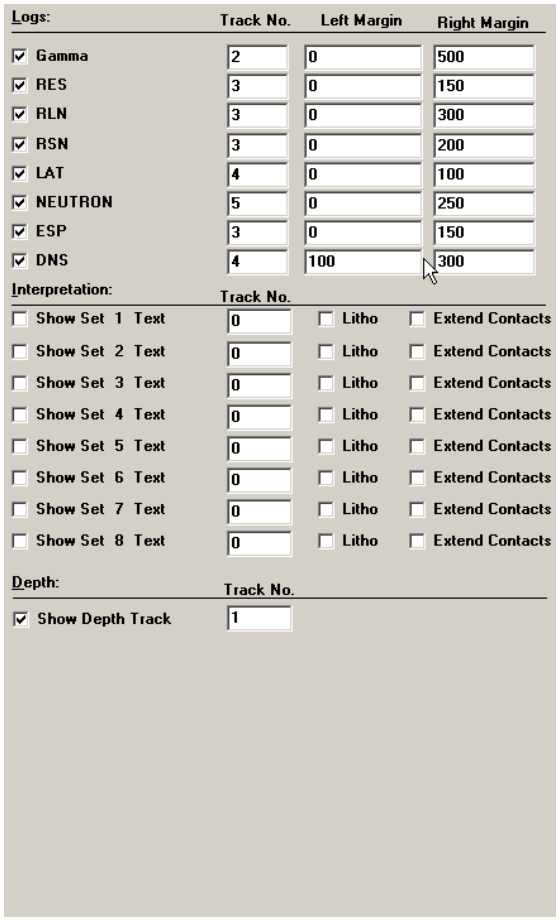
Log Display: The Log Display window provides detailed information about an individual log.

Display List: The Display List presents a list of all logs within the HDR file, along with their basic display parameters (see below).

TASK: Change the scale of the Gamma log display.

PROCEDURE:

1. Select **Format/**Display List (shortcut: **F11**).
2. Change the left Margin and the right margin of the Gamma log to correspond to those in the figure below.
3. To suppress the display of the Gamma log, for example, uncheck the box beside the word Gamma.
4. Click **OK** to close the **Display List** window.


Logs:
Track No.
Left Margin
Right Margin
Gamma 2 0 500
RES 3 0 150
RLN 3 0 300
RSN 3 0 200
LAT 4 0 100
NEUTRON 5 0 250
ESP 3 0 150
DNS 4 100 300
Interpretation:
Track No.
Show Set 1 Text 0 Litho Extend Contacts
Show Set 2 Text 0 Litho Extend Contacts
Show Set 3 Text 0 Litho Extend Contacts
Show Set 4 Text 0 Litho Extend Contacts
Show Set 5 Text 0 Litho Extend Contacts
Show Set 6 Text 0 Litho Extend Contacts
Show Set 7 Text 0 Litho Extend Contacts
Show Set 8 Text 0 Litho Extend Contacts
Depth:
Track No.
Show Depth Track 1

The Display List Window.

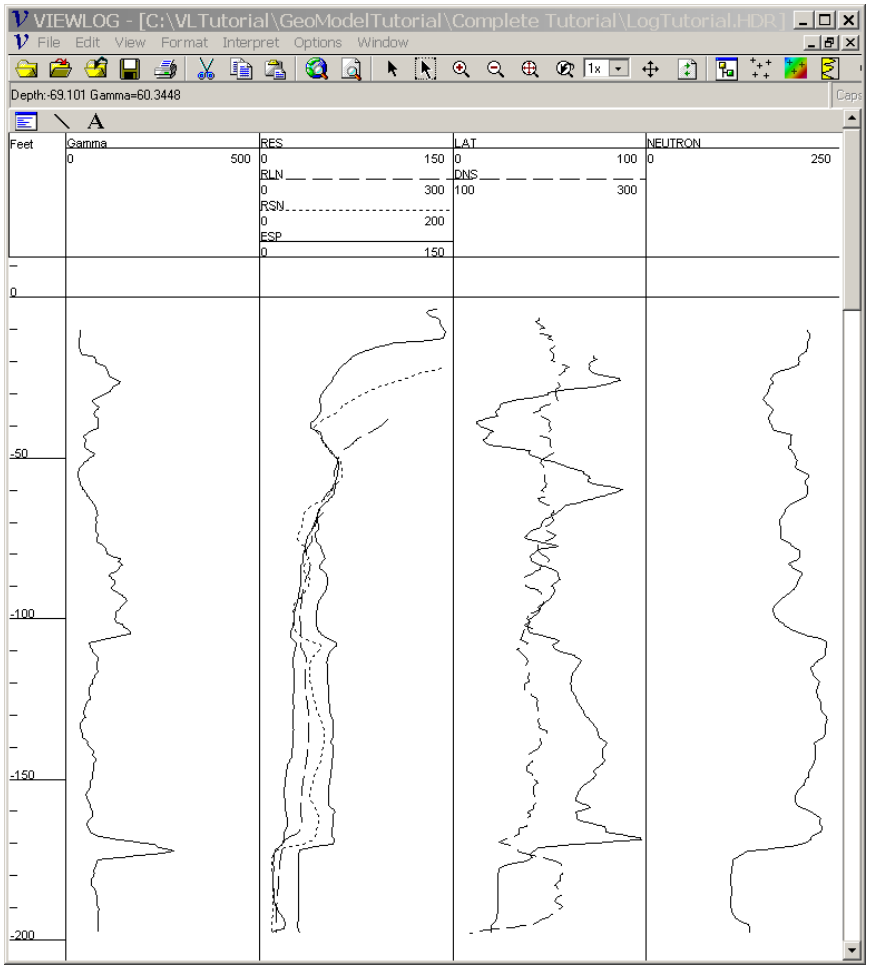
Changing the Track Order

Sometimes the logs are not imported in the order that you prefer. It is easy to change the order of the logs displayed. In addition, a single track can include several different parameters.

TASK: Rearrange the tracks in the log display.

PROCEDURE:

1. Select **Format/**Display List (shortcut: **F11**).
2. Change the log data track numbers until they correspond to those shown in the figure below. When editing a track number, the up and down arrows can be used to move to other track numbers in the column.
3. Click **OK** to close the **Display List** window.



Changing the Track Order.

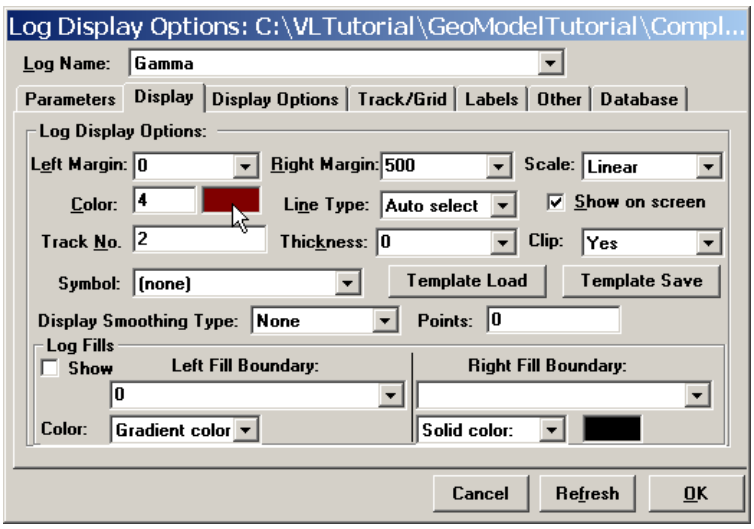
Changing the Color of the Logs

Using different colors for the logs can be helpful, particularly when more than one log appears in a column.

TASK: Change the color of the logs.

PROCEDURE:

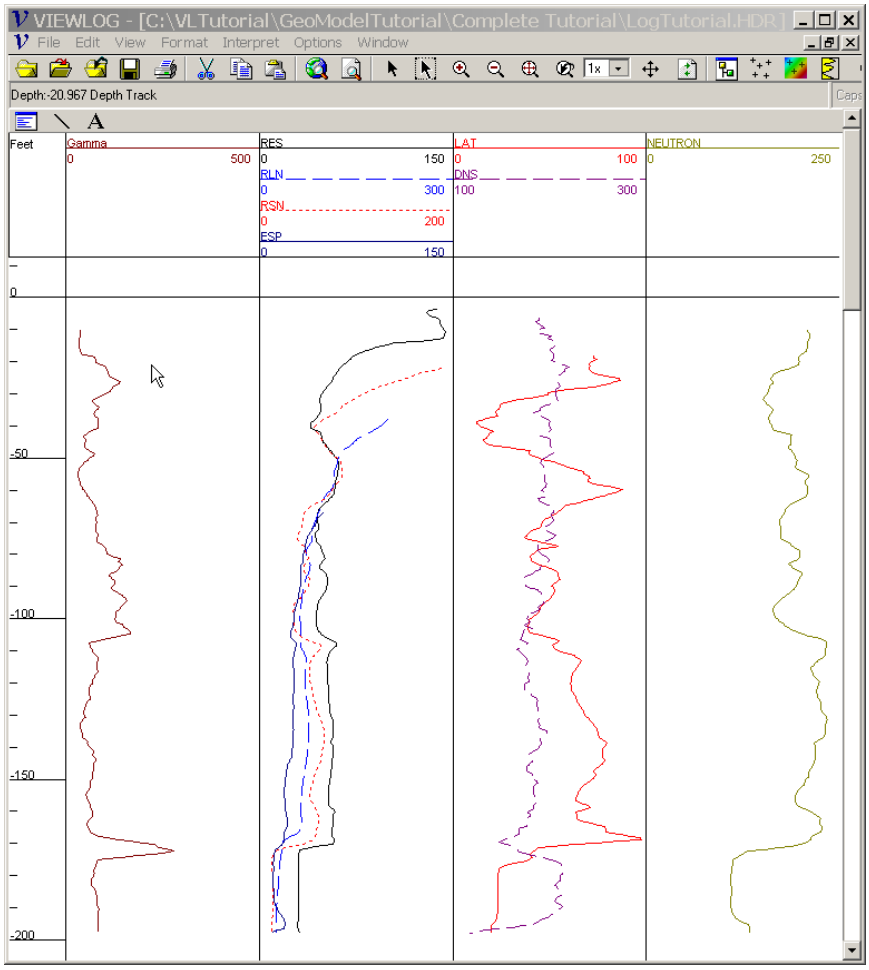
1. Select **Format/**Log Display. A window will appear as shown below.
2. Select the Gamma log from the **Log Name** dropdown list box at the top of the menu.
3. Click on the **Display** tab, as shown in below.
4. Click on the colored box beside the word **Color** and select brown.



The Log Display Window.

5. In a similar manner, change RLN to blue, RSN to red, LAT to red, DNS to purple, NEUTRON to olive green and ESP to dark blue, as shown below.

Note: To change the color of additional logs, double click on the log trace in the Log Editor. The **Log Display** window will load with the parameters from the selected log. Generally, darker colors are best for the log traces, while lighter colors are better for log fills, which are described in the following section.



Changing the Color of the Logs.

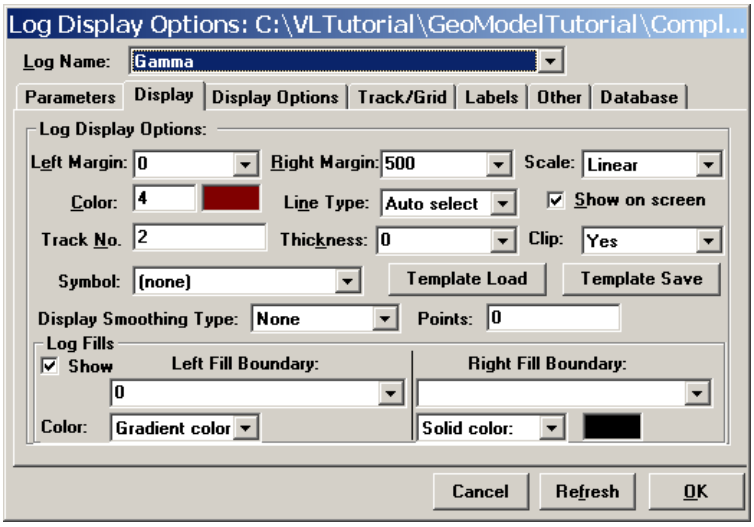
Filling Between Logs

Log Fills can be used to enhance the display of the log data by shading the space between logs, or between a log and a constant value.

TASK: Fill in some of the logs with different colors.

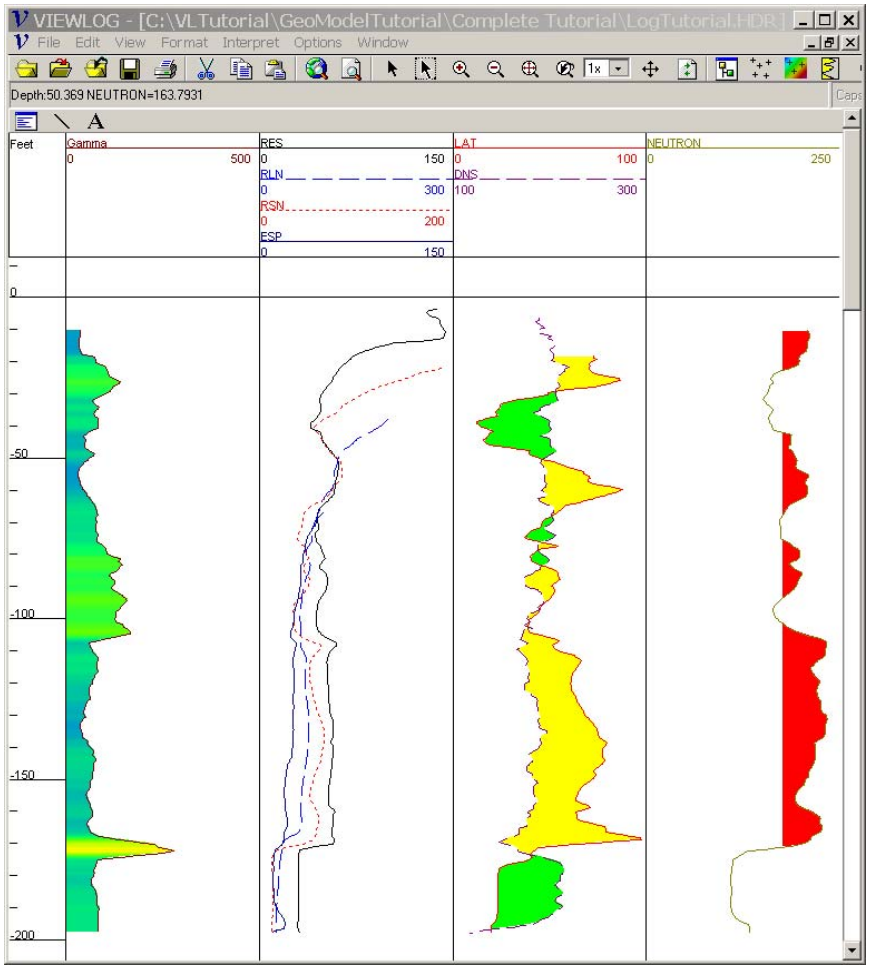
PROCEDURE:

1. Select **Format/**Log Display**.** and make sure the **Log Name** is set to Gamma at the top of the window.
2. The left and right fill boundaries, in which logs and constant values can be specified, control the fills. Logs can be selected by pressing the down arrow beside each **Fill Boundary** box, and then selecting the log name.
3. To set the gamma constant value of 0, enter 0 in the **Left Fill Boundary** box, as shown above. Make sure to check on **Show** in the **Log Fills** section.
4. For **Color:** select the **Gradient color** option.



The Log Display Window for Log Fill.

5. To fill between the LAT and DNS logs, first select the LAT from the **Log Name** drop down list box at the top of the window. Check on **Show** in the **Log Fills** section. Select DNS for the **Left Fill Boundary**, and the LAT for the **Right Fill Boundary**. Select the color yellow for the fill. In general, bright, or lighter, colors are best for log fills.
6. Change the **Log Name** to DNS. Check on **Show** in the **Log Fills** section. Select LAT for the **Left Fill Boundary**, and the DNS for the **Right Fill Boundary**. Select the color green for the fill.
7. Select the NEUTRON track from the **Log Name** drop down list at the top of the window. Check on **Show** in the **Log Fills** section, and set the **Left Fill Boundary** to 175. Set the **Color** to red.
8. Once all the parameters are set, ensure that the **Show box** is checked on, and then select **OK** to exit. The screen should appear as shown below.
9. Save your log by clicking **File/**Save as Template HDR.



The Screen Display showing Log Fills.

Lesson 12: Correcting Log Data

Correcting Log Depths

Before interpretation, the data must be corrected for depth offset between the logs. Depth correction can be performed two ways:

Editing the log start depth in the **Log Display** menu

Graphically depth shifting the logs using the **Edit/**Depth Shift function.

TASK (OPTIONAL): Shift (depth correct) the Gamma log into alignment with the other logs.

> **Note:** In this case, the log does not actually need to be shifted. The procedure outlined below is only to describe the log shifting method.

PROCEDURE:

1. From the menu bar, click on **View/**Zoom In. Click the left mouse button on the Gamma log at elevation 0 and drag down to an elevation of –100 to zoom in on this area.
2. Select the **Edit/**Depth Shift menu item to switch to the Depth Shift function. The status line should read "DEPTH SHIFT: Press and drag the left mouse button to define the shift.."
3. Click and hold the left mouse button on the gamma log trace at an elevation of -50, then drag the mouse to an elevation of -60. When the mouse button is released, the gamma log will be redrawn at the new depth. Click **Esc** to exit out of Depth Shift mode.
4. The depth correction function may be repeated to refine the log position. To increase depth correction accuracy, reduce the on-screen thickness by using the Zoom functions.

Correcting Log Depths of Multiple Logs

Multiple logs can be depth shifted at one time using **Edit/**Select Logs.

TASK: Select a group of logs for depth shifting.

PROCEDURE:

1. To select a group of logs, select **Edit/**Select Logs, and then click on each log trace, or the log name at the top of the data window. The status line will display how many logs are selected.
2. Once logs are selected, select **Edit/**Depth Shift.
3. Enter the amount of the depth shift in the window and select **OK** to shift the logs.
4. Select the **Edit/**Cancel Current Function (or press **F3**) to unselect the logs.

Smoothing Log Data

Another feature in the Log Editor is log-data smoothing. This function is very useful when working with nuclear logs, which are recorded using a statistical counting process. Two

smoothing filters are available: "boxcar" and "taper" weighted moving averages. When using the boxcar filter, each of the *n* points within the filter zone is equally weighted.

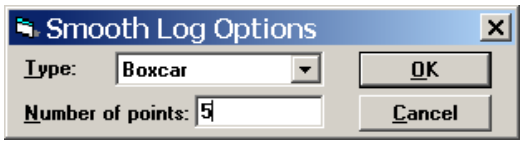
The size of the filter zone is related to the digitization interval. For example, if the log selected for smoothing has a digitization interval of 0.1 m, an 11-point boxcar filter is equivalent to a 1-m weighted moving average (the log value at each depth point represents the average value of the measurements within 0.5 m above and below).

> **Note:** When using the taper filter, the log values near the center of the taper filter are weighted greater than those at the edges. A taper filter will smooth the log less than a boxcar filter of the same size.

TASK (OPTIONAL): Smooth the Neutron log with an 5-point boxcar weighted moving average.

PROCEDURE:

1. Select the **Edit/**Smooth Logs menu item, and then click on the Neutron Log trace. The **Smooth Log Options** window will appear, as shown below.



The Smooth Log Options Window.

2. Select a Boxcar smoothing function, and enter 5 for the **Number of points**. Select **OK** to perform the smoothing.
3. Once the smoothing is completed, the results will be drawn over the unsmoothed data in a different screen color.
4. Select **Yes** to accept the smoothing results.

Adding Log Interpretation

The next stage of the lesson involves adding interpretation to the log data. VIEWLOG provides functions for defining contacts and adding lithologic descriptions to the logs. When the file is saved, all descriptions are stored in the header file for later reference. Key words entered in the text descriptions can be used to create a lithology symbol column.

TASK: Set the screen for log interpretation.

PROCEDURE:

1. Select the **Format/**Display List menu item.
2. Place a check in the Interpretation: **Show Set 1** check box.
3. Set the **Track Number** to 12.
4. Select **OK** to exit the **Display List** menu. A single blank column should appear on the right side of the screen.

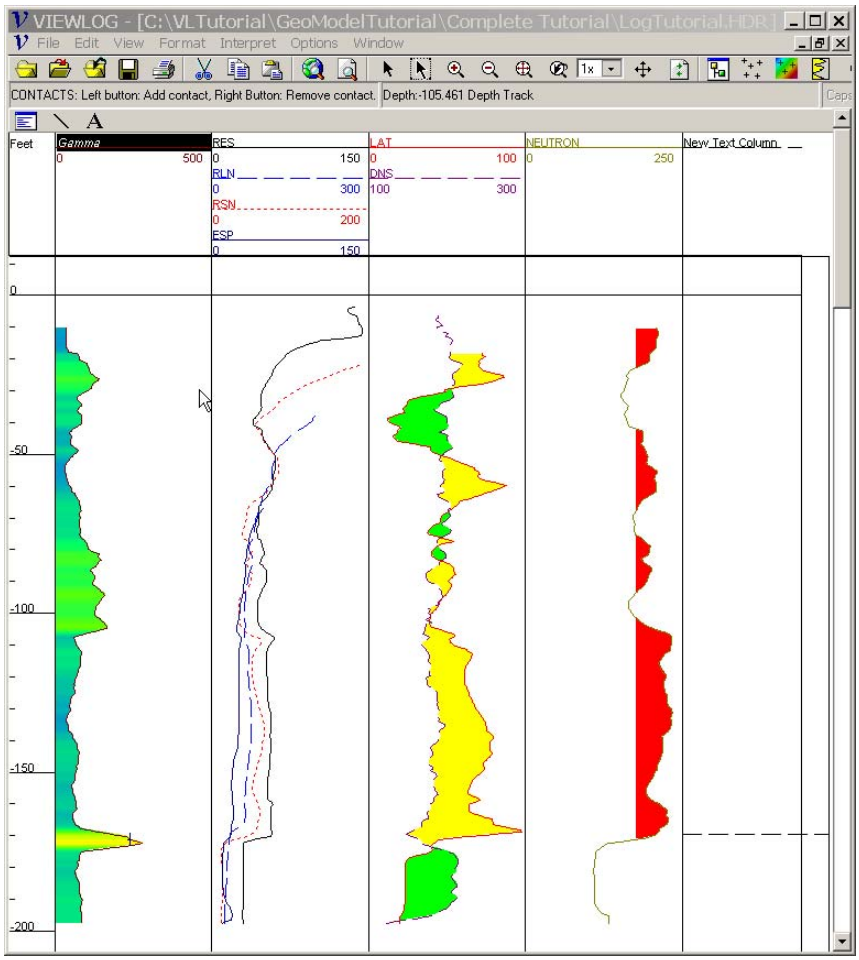
Adding Contact Lines

Geologic contacts, or marker lines, can be placed on the log data in **Interpret/**Contacts. Contacts are added by pointing within an interpretation column and pressing the left mouse button, and removed by pointing at the contact and pressing the right button.

TASK: Place contact markers at an elevation of –171 feet.

PROCEDURE:

1. Create a new column by selecting **Edit/Create New…/**Text/Litho/Photo Column.
2. Select **Interpret/**Contacts (Shortcut: **Ctrl+O**). Note that once you have done this, the status bar in the upper left corner of VIEWLOG will remind you that you are in "CONTACTS" mode.
3. While pressing (and holding) the left mouse button within the blank right column, adjust the elevation of the mouse cursor to -171 feet. When the depth is reached, release the button to place a contact marker line.
4. If necessary, a contact may be removed by pointing at the contact line (make sure you have selected **Interpret/**Contacts, and that you are in "CONTACTS" mode, as noted in the status line in the upper left corner of the VIEWLOG window), pressing the right mouse button. All depths are recorded into memory and are stored to disk when the file is saved.



Screen Display Following the Addition of a Contact Line.

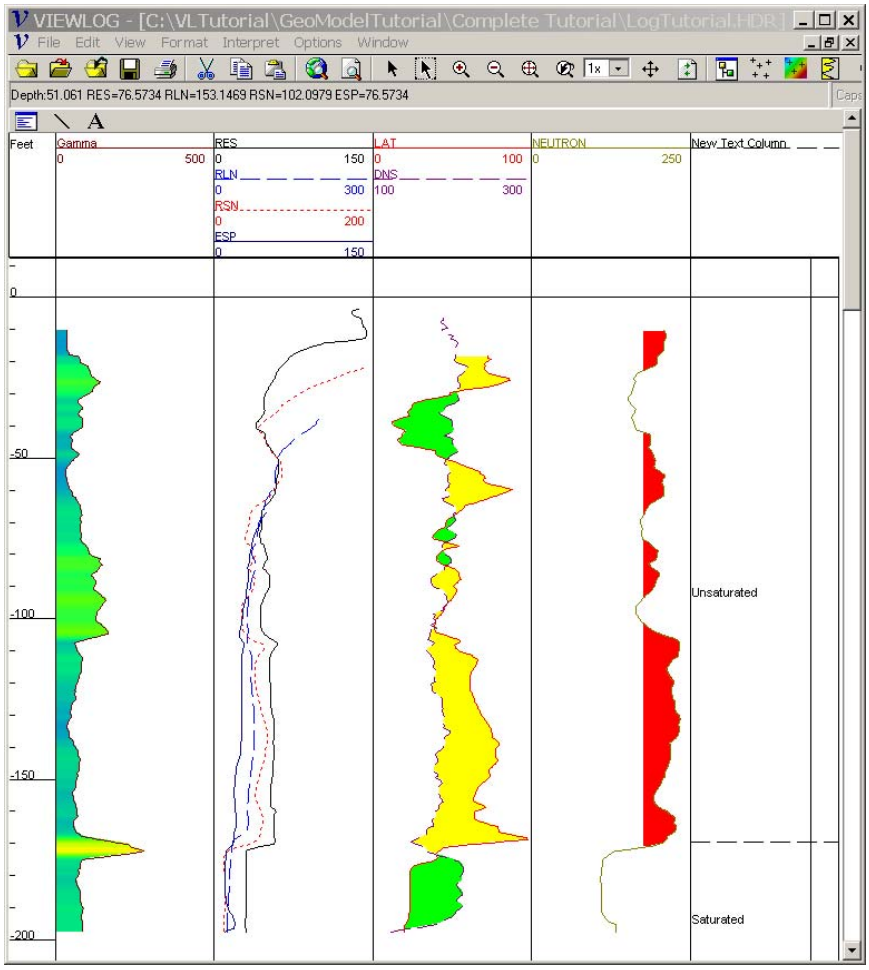
Adding Interpretation Text

A similar procedure is used to add text descriptions to the log data. Text messages are added at specific depths, and are independent of the contact lines. Text is added with the left mouse button, and removed with the right button.

TASK: Label the zone above the water table as “Unsaturated”, and the zone below the water table as “Saturated”.

PROCEDURE:

1. Select **Interpret/**Text Description (Shortcut: **Ctrl+T**).
2. Press the left mouse button while pointing within the text column at a depth of approximately -90 feet. The program will display a text input box at this location. Type "Unsaturated” and press **Return** to complete the task.
3. Repeat the process by clicking the left mouse button at -182 feet and enter the text "Saturated". Press **Esc** to cancel the current function. Upon completion, the screen will appear as shown below.



Screen Display Showing Text Interpretation.

> **Note:** The **Ctrl-Click** and **Shift-Drag** mouse operations can be used to edit or depth-shift an existing text message box.

Performing Log Calculations

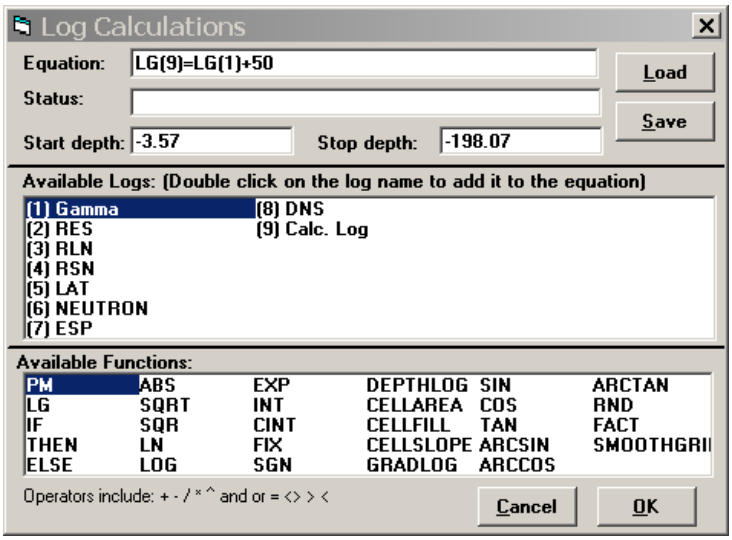
The **Interpret/**Log Calculations menu item is used to perform log calculations. Equations are entered in a similar manner as a spreadsheet, allowing a high degree of flexibility.

TASK (OPTIONAL): Correct the Gamma log by adding a constant value of 50.

> **Note:** In this case, the data does not actually need to be corrected; the purpose of this task is to show you how to correct the data should it be necessary. In this example, this could represent a baseline shift due to instrument error.

PROCEDURE:

1. Select **Interpret/**Log Calculations.
2. Click once on the Gamma log to select the entire depth range for processing (to process only a limited depth interval, click and drag in a manner similar to zooming).
3. Once the depth range is defined, the program will enter the **Log Calculations** window as shown below.

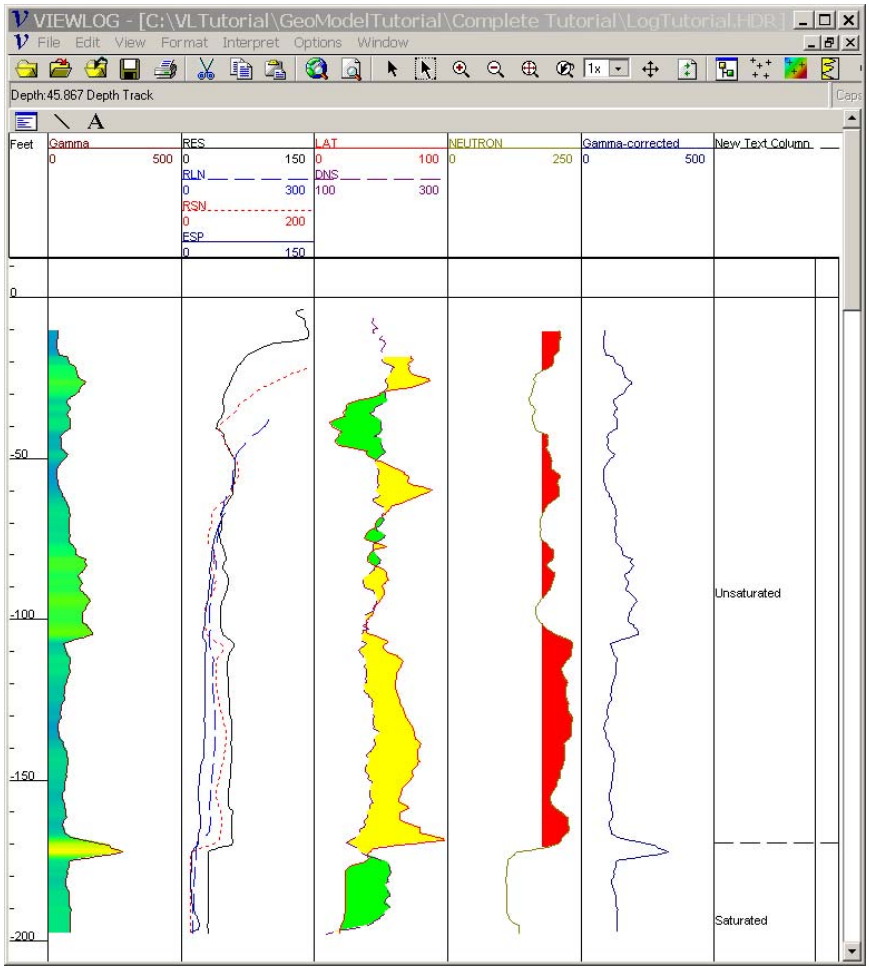


The Log Calculations Window.

4. To convert the gamma log, enter the formula exactly as follows: LG(9) = LG(1) + 50 in the **Equation** line. This will create a new log by adding 50 to the existing Gamma log.
5. Select **OK** to perform the calculation. Errors in the equation will be indicated with an error message in the **Status** box.
6. Once processing is complete, the program will redraw the screen. Select **Format/**Display List to review the log display parameters for the new log, which, by default, is called "Calc. Log". Change the Calc Log display parameters to show a log

range of 0 to 500, and make sure that it is displayed. Move the Text Interpretation Set 1 to Track 7, and move the Calc. Log to Track 6.

7. To rename the Calc. Log, select it by double clicking. In the **Log Display Options** window, click on the **Parameters** tab and change the Log Name to: Gamma-corrected. Click on **OK** to close the **Log Display Options** window.



Final Log Calculation Results.

Adding Grid Lines to Logs

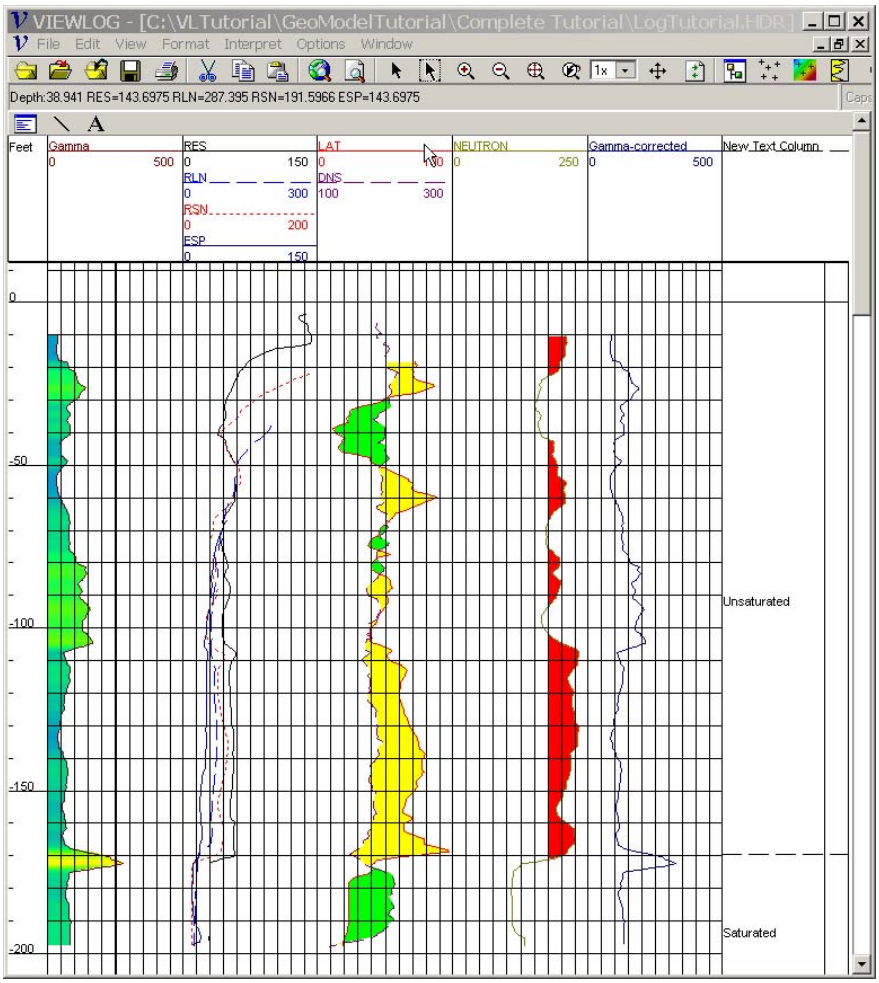
In the Log Editor, grid lines can aid in the interpretation of log tracks.

TASK: Add API grid lines.

PROCEDURE:

1. Right click on any of the existing log tracks, and select **Attributes**.
2. Select the **Track/*Grid*** tab.
3. In the **Default Track Settings** (all logs) section, uncheck the **Suppress all grid lines** checkbox and place a check in the **API Format Grid** checkbox.
4. Click on **OK**.

5. Change the **Grid**, **Label** and **Tick** Increments to 10, 50, and 10, respectively, by selecting the **Format/**Depth menu item, and selecting the **Labels and Grid** tab. Your logs should resemble those shown in the figure below.



Logs with Grid Lines.

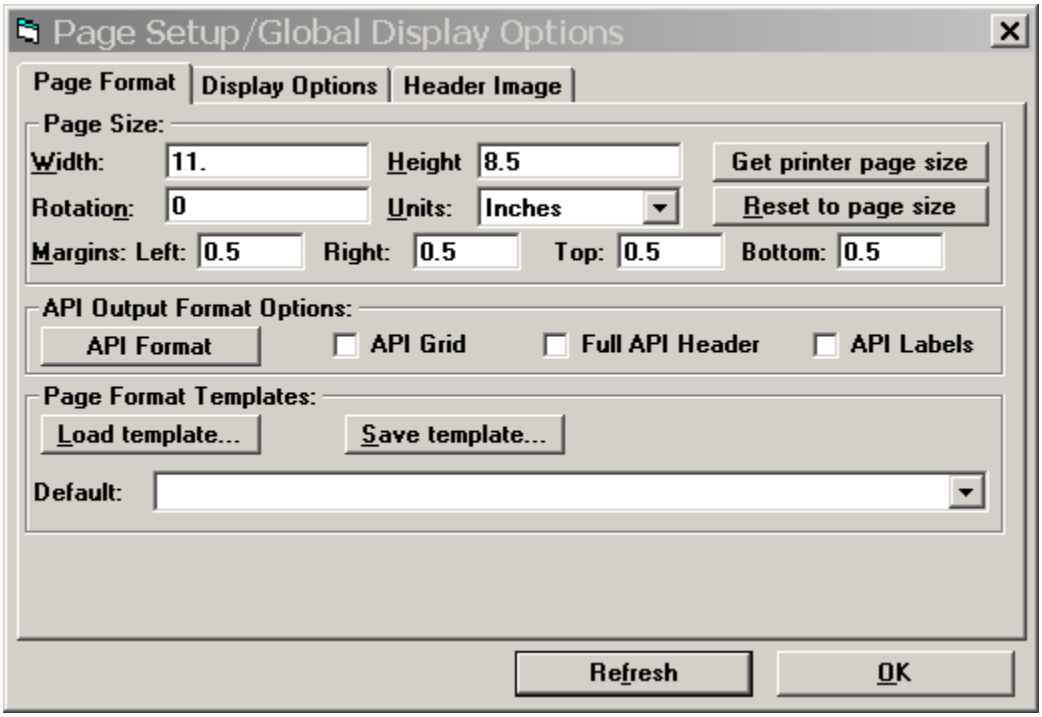
Generating Log Data Output

When printing logs, VIEWLOG uses the current log scaling parameters as the default format. This simplifies output, as setting up the screen to display the logs, depth and scaling parameters is equivalent to setting the output format.

TASK: Create a paper copy of the logs.

PROCEDURE:

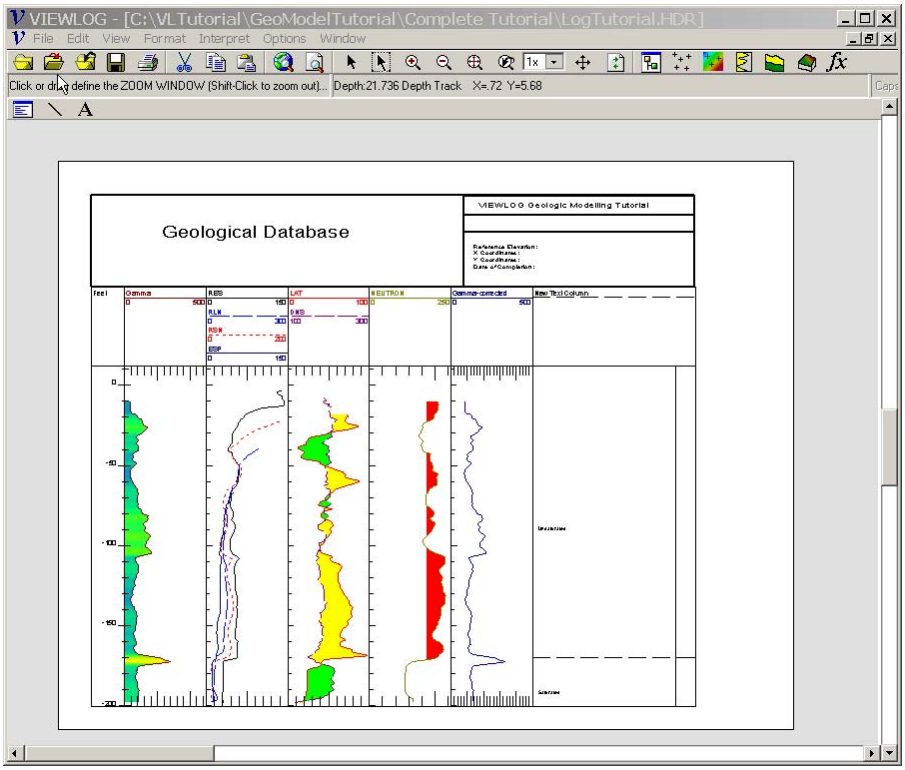
1. Begin by selecting **View/**Zoom All, thereby showing the entire well on screen.
2. Select the **Format/**Page/Global Settings menu item. This window controls the overall format of the plot. Most important are the **Page Size, Width** and **Height** parameters. To have VIEWLOG select default format values for a landscape mode plot, enter a **Page Width** of 11 and **Page Height** of 8.5 inches and then select **Refresh**.



The Page Setup/Global Display Options Window.

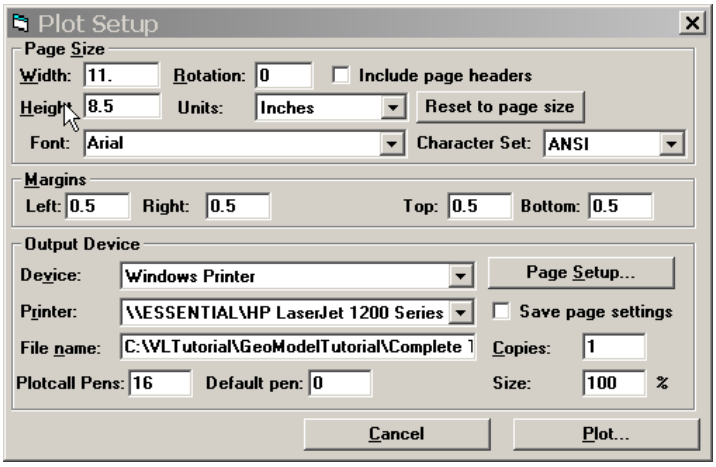
3. Select the **Header Image** tab and select C:\VL Tutorial\GeoModelTutorial\VL Tutorial Header landscape.map. Click on **In line image**. Click **OK** to return.
4. Select the **Format/**Depth menu item, and make sure the **Fit to depth column length** check box is unchecked. Set **Start** to 0 and **Stop** to –200 and the Scale to 1:500 for **Print and Preview mode.**
5. Select **OK**.
6. Select the **View/**Preview Mode menu item to have VIEWLOG draw an exact representation of the plot on screen, as shown below. While some log editing and interpretation functions are not available in Preview mode, all the **Format** menu functions can be used.

Note: The zoom and pan functions continue to operate, and that double clicking on a log trace, header or depth track will load the appropriate format menu window.


VIEWLOG - [C:\VLTutorial\GeoModelTutorial\Complete Tutorial\LogTutorial.HDR]
File Edit View Format Interpret Options Window
Depth:21.736 Depth Track X=.72 Y=5.68
Geological Database
VIEWLOG Geologic Modelling Tutorial

Log Output Preview Mode.

7. To create the plot, select **File/**Print to load the **Plot Setup** window. Click on the **Page Setup** button to change the page orientation to Landscape mode. If the configuration is acceptable, select **Plot…** to send the output to the printer.



The Plot Setup Window.

8. To save your tutorial changes, select **File/**Save As, enter a new filename and press **OK**.

Downhole Geophysical Tutorial

Introduction to borehole data management, downhole geophysical analyses, multi-well cross plotting, autoprediction and geologic modelling.

INTRODUCTION TO DOWNHOLE GEOPHYSICAL TUTORIAL

VIEWLOG provides a truly integrated borehole data management and interpretation system and geological modelling. VIEWLOG Project Management offers the means to fully integrate the data for an effective, interactive and enhanced analysis. VIEWLOG data storage is built on an open, relational database structure that can be fully customized by the end user. VIEWLOG can simultaneously access the data, allowing real-time interactive query setup and display. By tightly coupling a powerful borehole Log Editor with GIS-style mapping and 3-D cross-section tools, VIEWLOG offers an unrivaled level of visual interpretation control.

VIEWLOG Project Management

Project files: *.PRJ

The database and geologic modelling functions in VIEWLOG are organized through the Project file. The Project file contains the common elements of the geologic model and all primary links to the database. In the Project file, objects such as 3-D surfaces can be simultaneously viewed on multiple maps and cross sections.

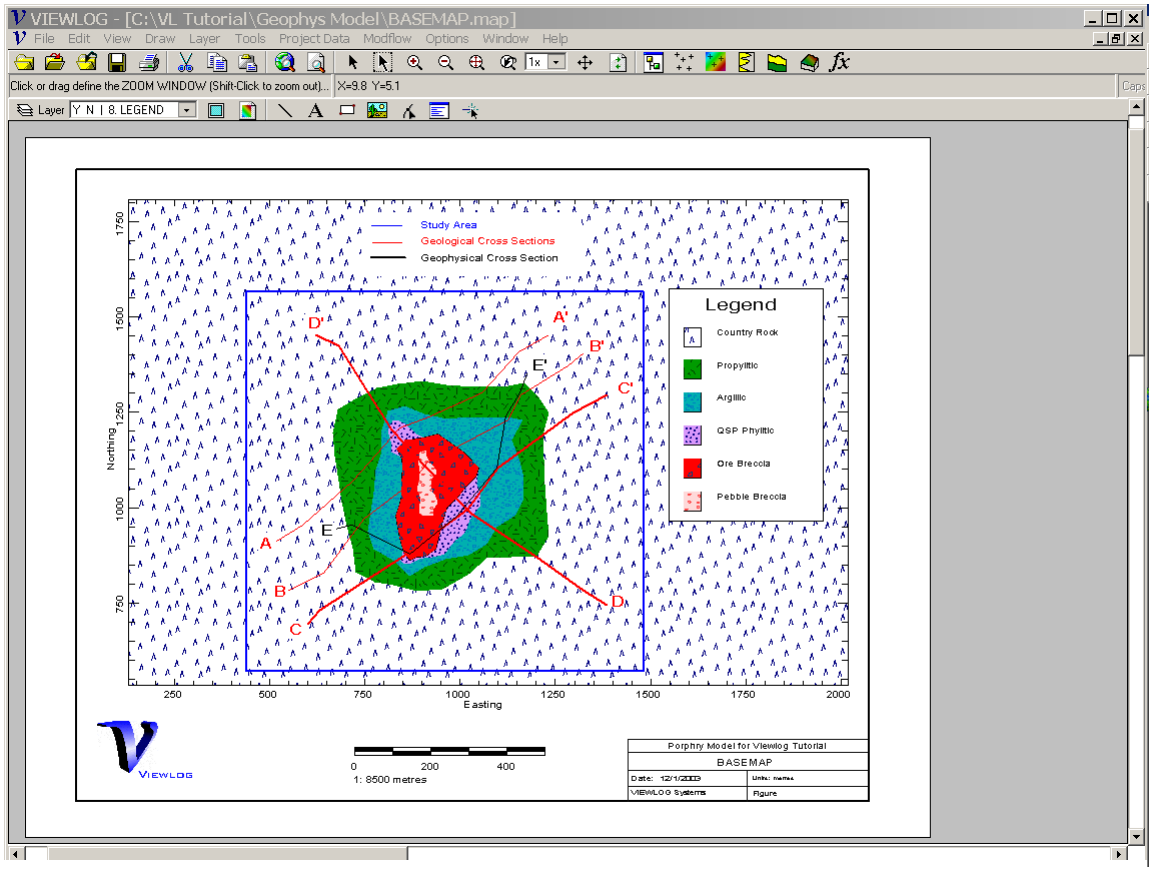
Microsoft Access Database: *.MDB

Microsoft Access is the most commonly used desktop database with VIEWLOG. Other databases, such as Oracle and SQLServer can also be connected to VIEWLOG. In addition, spreadsheet files (e.g., MS-EXCEL, *.XLS extension) can be connected to VIEWLOG.

VIEWLOG Map Editor

Maps and Cross Section Lines and Text: *.MAP

The integrated Map Editor includes drawing, database and GIS functions optimized for the geosciences. The Map Editor acts as a CAD/GIS drawing system for interpreting and extending borehole data. Interpretation can be performed using simple drawing tools or can extend to comprehensive geological modelling. The Map Editor supports high-level objects, such as boreholes and 3-D surface and has integrated functions such as kriging. Cross sections can be easily generated along any chosen path through the project area and all section interpretation is performed in 3-D coordinate space. VIEWLOG Map Editor files (plan view and cross section) have the file extension “MAP”.



VIEWLOG in Map Editor mode.

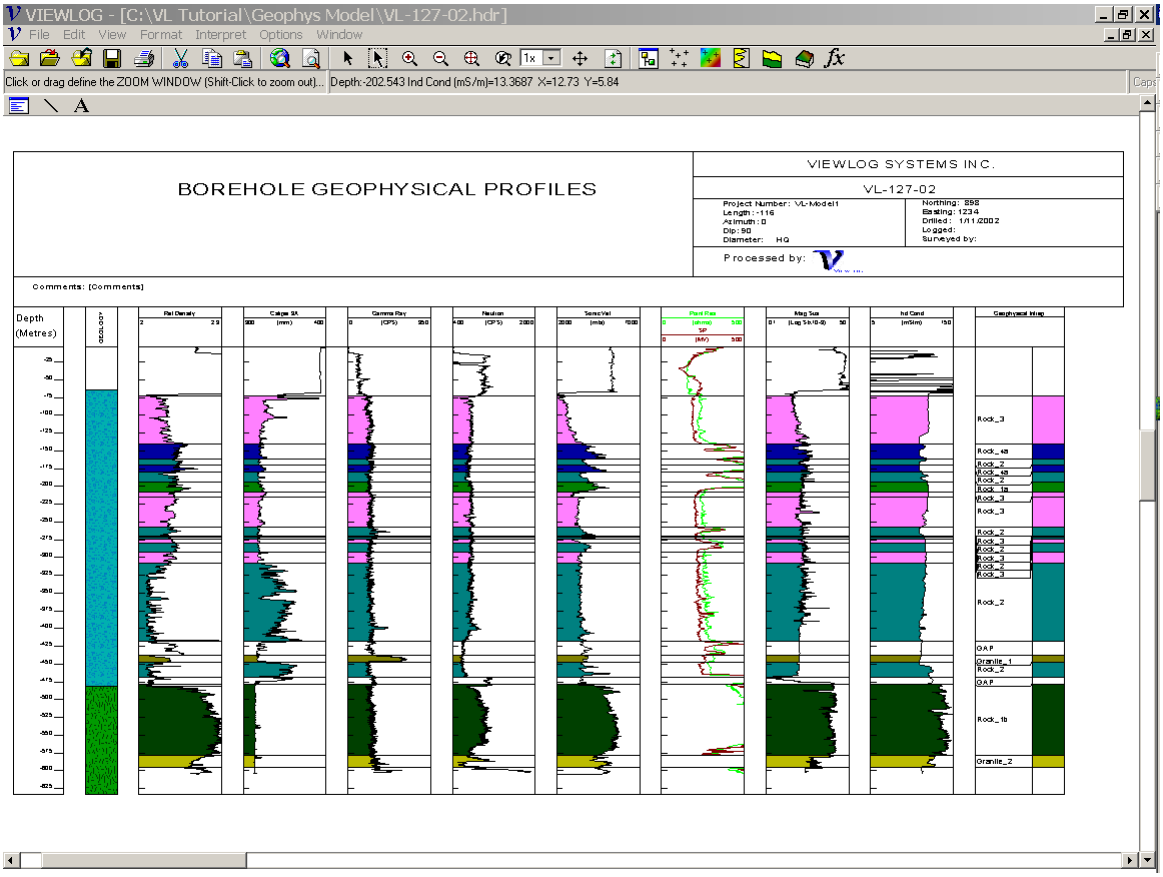
Gridded Interpolation Results: *.GRD

The interpolation of borehole measurements produces a parameter estimate at every grid cell location. This information is stored outside of the database, because it is secondary or “derived” from the raw measurements. These files can be quite large, depending on the number of cells in the grid.

VIEWLOG Log Editor

Well Log Headers: *.HDR

The Log Editor is used to integrate, display and interpret various downhole measurements ranging from geophysical logs, core descriptions, chemical analysis, water levels and core photos. The Log Editor is used to correct, interpret and prepare data for stratigraphic correlation, mapping, and geological modelling. Log data files typically have the file extension “HDR”, which is an abbreviation for “Header”. The HDR files contain information about the well, including a list of all logs from that well.



The VIEWLOG Log Editor.

Downloading Tutorial Files

The self-extracting file will unpack all the files required by the tutorial into a main directory called C:\VL Tutorial. The subdirectory c:\VL Tutorial\Geophys Model\ contains the basic files needed to complete the following \Geophys Model\Completed Tutorial contains the completed VIEWLOG tutorial project for lessons.

TASK: Download and install the tutorial files.

> **Note:** It is very important to unpack the files to the C:\ in order for the Completed Tutorial to open correctly.

PROCEDURE:

1. Place Tutorial.exe to a temporary directory of your choice.
2. Click on the file.
3. Unpack all the files to C:\. This will automatically unpack all the files and subdirectories to a directory called C:\VL Tutorial.

> **Note:** When completing the tutorial it is important to save YOUR work in the C:\VL Tutorial\Geophys Model\directory. **Do not to overwrite anything in the C:\VL Tutorial\Geophys Model\Completed Tutorial directory,** as this

directory contains all the necessary files for the completed VIEWLOG tutorial project for reference purposes.

Lesson 1: Getting Started in the Log Editor

The Log Editing and Analysis tutorial is designed to be a step-by-step introduction to the process of editing and adding text interpretation to a suite of geophysical logs.

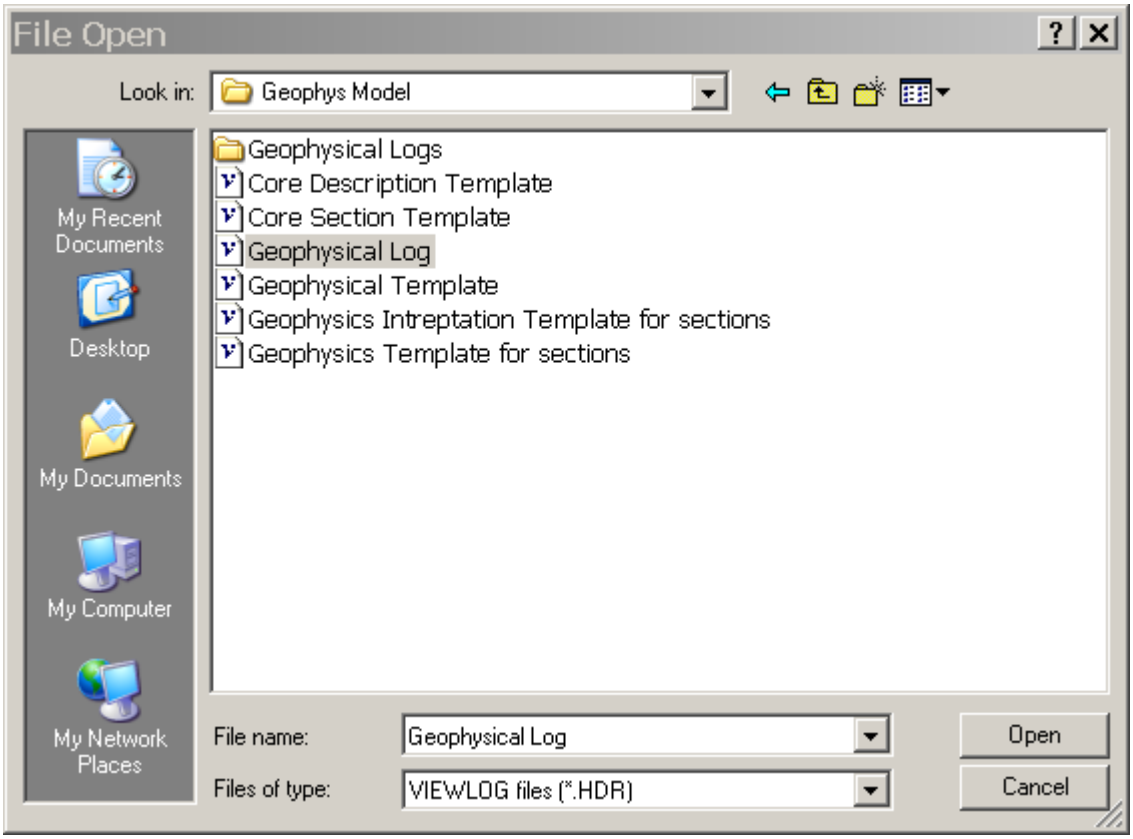
The complete tutorial follows the general process of correcting and interpreting data from recently logged wells in an exploration setting. This includes adjusting the data presentation, correcting the logs, adding interpretation, output of the results, multiwell interpretation, physical property analysis and geological modeling.

> **Note:** When editing logs, the **View/**Preview Mode menu item can be used to display an exact representation of the log data output. Preview Mode works like the Print Preview mode in programs such as MS WORD and EXCEL. Regions outside of the current page area appear grey when the Log Editor is in Preview Mode. While in Preview Mode, certain log data processing functions are not, however, available. The menu items for these functions appear "grayed" when they are unavailable.

Selecting a file

To begin the tutorial, start the program and select the **File/**Open Log File to display the **File Open** window, as shown below. By default, the **File Open** window displays a list of VIEWLOG HDR well data files.

To load the tutorial file, first change to the C:\VL Tutorial\Geophys Model\ directory by double clicking on the directory name in the directories list box. Select the file "Geophysical Log.hdr" then click **OK** to load the file.

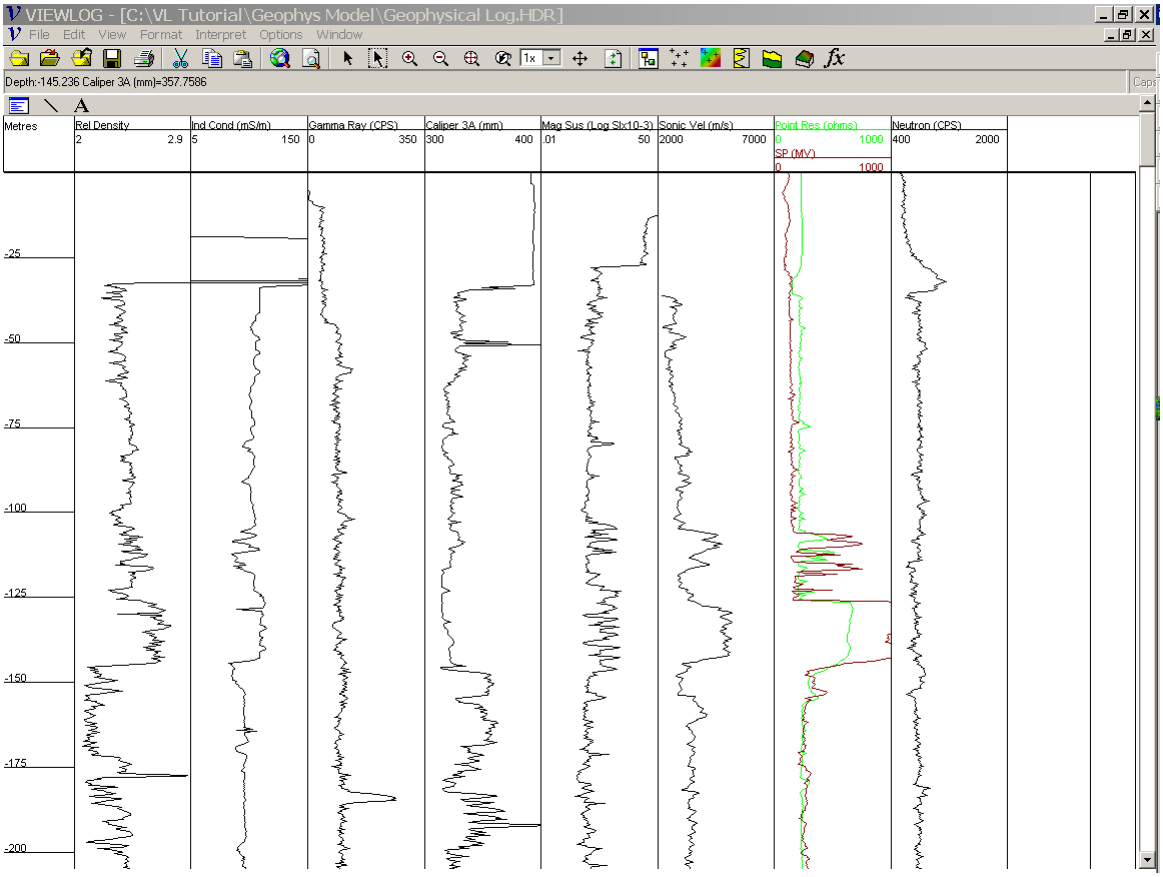


Opening the Geophysical Log.hdr file.

Note: During your HDR file editing session, it is important to note that any changes and interpretations are made only to data retained in the computer's memory. No changes will be saved until the program is directed to do so, allowing changes to be abandoned by exiting without saving the file. When log-editing changes are saved, all related parameters are written to disk, including editing changes, interpretation, and the configuration of the log display.

The Log Editor

After opening the Geophysical Log.hdr file, the program will enter the Log Editor (see below).



The Log Editor.

Changing the Thickness of Data Displayed

The thickness presented on the screen can be changed using a number of functions available in the **View** menu. One simple method is to select the **View/**Thickness menu item. Increasing the thickness allows review of the entire well, while reducing the thickness improves the accuracy of mouse movement and interpretation.

TASK: Change the thickness of data displayed to 50 feet.

PROCEDURE:

1. Select the **View/**Thickness menu item.
2. Enter the new thickness of 50 and press **Enter**.
3. The screen will redraw, showing the new thickness.

Using the Zoom Functions

The **View/**Thickness option is only one of a number of methods to change the vertical depth scaling found in the **View** menu.

TASK: Change the screen to display the data between 20 and 40 feet, with the mouse.

PROCEDURE:

1. Select the **View/**Zoom In menu item. Notice how the status line now displays **Press and drag the mouse to define a ZOOM WINDOW...**
2. Move the mouse to Elevation = -20, and place the cursor in the Gamma log column.
3. Press (and hold) the left button and drag the mouse down and to the right, until the elevation reads approximately -40 feet. A rectangle will form on the screen, showing the size of the zoom window.

> **Note:** Only the vertical size of the window is used, and that the scaling of the gamma log is not affected by the width of the zoom box.

4. Release the mouse button to redraw the screen.
5. Select **Edit/**Cancel Current Function or press **F3** to cancel the Zoom function.

> **Note:** The same zoom procedure can also be performed with the right mouse button at any time (except if the right mouse button is in use for another function, such as removing contact lines).

Changing the Log Scales

There are two windows, accessed from the Format menu, which can be used to control log scaling. These include:

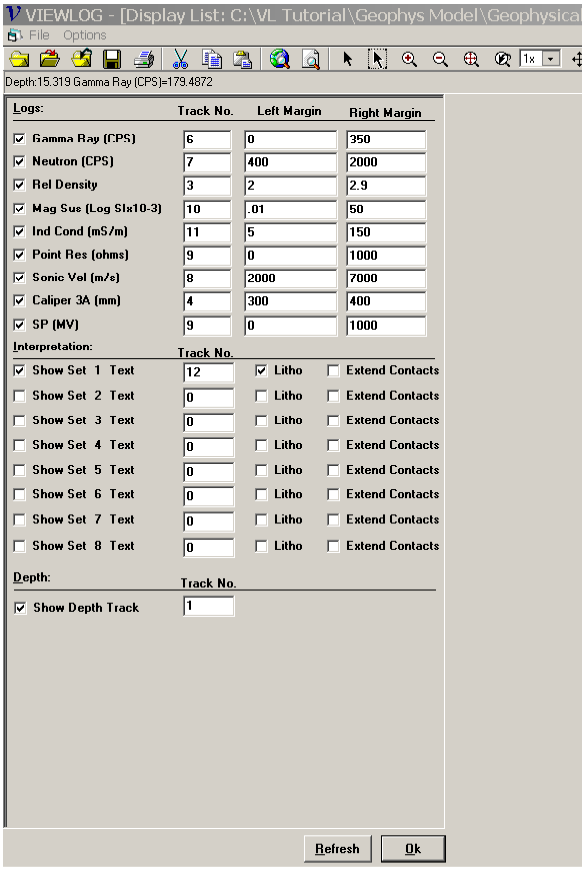
Log Display: The Log Display window provides detailed information about an individual log.

Display List: The Display List presents a list of all logs within the HDR file, along with their basic display parameters (see below).

TASK: Change the scale of the Gamma log display.

PROCEDURE:

1. Select the **Format/**Display List menu item (shortcut: **F11**).
2. Change the left Margin and the right margin of the Gamma Ray Log to correspond to those in Figure 5.
3. To suppress the display of the Gamma log, for example, clear the **X** from the box beside the word Gamma.
4. Return to the **View** menu by selecting **OK**.


VIEWLOG - [Display List: C:\VL Tutorial\Geophys Model\Geophysica
File Options
Depth:15.319 Gamma Ray (CPS)=179.4872
Logs:
Track No.
Left Margin
Right Margin
Gamma Ray (CPS) 6 0 350
Neutron (CPS) 7 400 2000
Rel Density 3 2 2.9
Mag Sus (Log Six10-3) 10 .01 50
Ind Cond (mS/m) 11 5 150
Point Res (ohms) 9 0 1000
Sonic Vel (m/s) 8 2000 7000
Caliper 3A (mm) 4 300 400
SP (MV) 9 0 1000
Interpretation:
Track No.
Show Set 1 Text 12 Litho Extend Contacts
Show Set 2 Text 0 Litho Extend Contacts
Show Set 3 Text 0 Litho Extend Contacts
Show Set 4 Text 0 Litho Extend Contacts
Show Set 5 Text 0 Litho Extend Contacts
Show Set 6 Text 0 Litho Extend Contacts
Show Set 7 Text 0 Litho Extend Contacts
Show Set 8 Text 0 Litho Extend Contacts
Depth:
Track No.
Show Depth Track 1
Refresh
Ok

The Display List window.

Note: The Display List window is preferred for rearranging the order and basic scaling of the logs because it presents a list of all logs within the file.

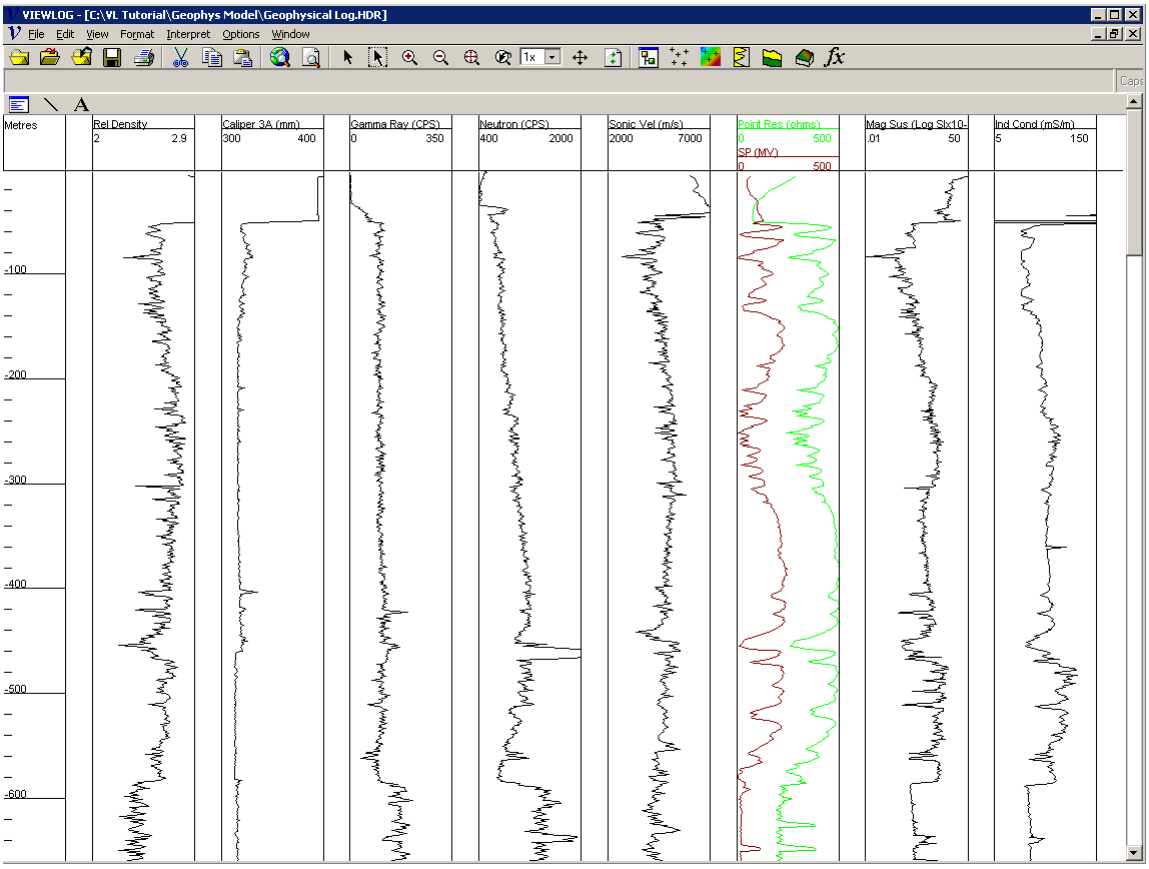
Changing the Order of Tracks Displayed

Sometimes the order in which the logs are imported is not in the manner that you would prefer. It is easy to change the order of the logs displayed.

TASK: Rearrange the tracks in the log display.

PROCEDURE:

1. Select the **Format/**Display List menu item (shortcut: **F11**).
2. Change the log data track numbers until they correspond to those in the figure above. When editing a track number, the up and down arrows can be used to move to other track numbers in the column.
3. Return to the **View** menu by selecting **OK**. The screen should appear as shown below.



Track layout.

Changing the Color of the Logs Displayed

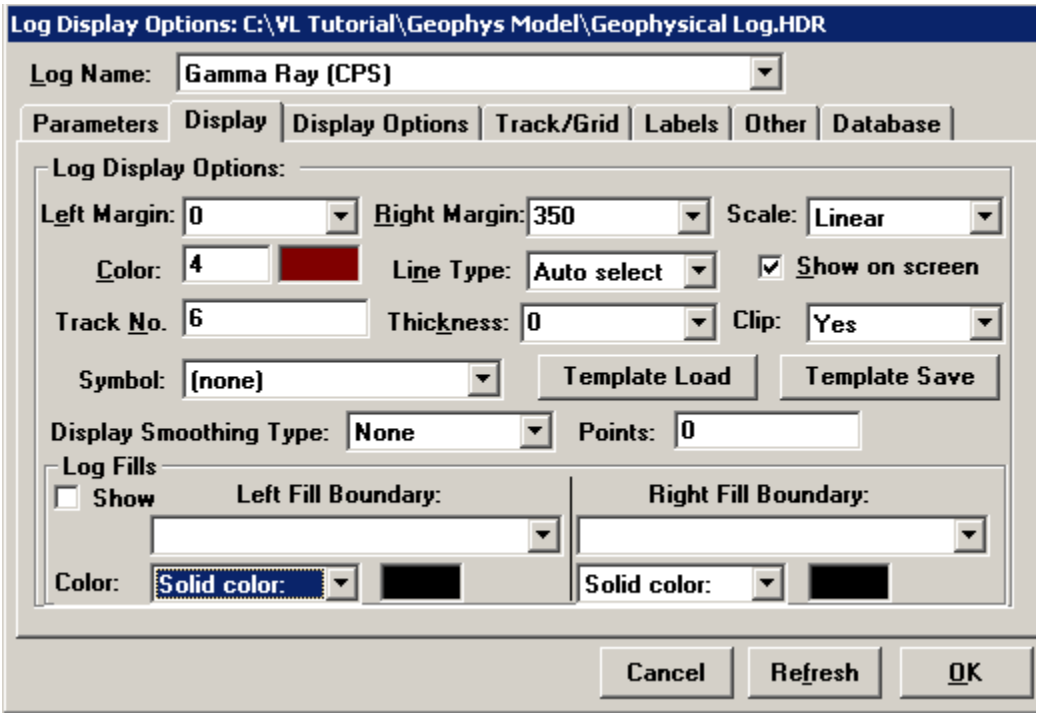
Often it is more visually pleasing to change the colours of the logs displayed in each track.

TASK: Change the color of the logs using the Log Editor.

PROCEDURE:

1. Select the **Format/**Log Display menu item. A window will appear as shown below.
2. Select the Gamma log from the **Log Name** dropdown list box at the top of the menu.
3. Click on the **Display** tab, as shown below.
4. Click on the Colored box beside the word **Color**:
   a. Select brown.
5. Click **OK** to exit the **Log Display** window.

> **Note:** To change the color of additional logs, double click on the log trace in the Log Editor. The Log Display window will load with the parameters from the selected log.



The Log Display window.

> **Note:** Generally, darker colors are best for the log traces, while lighter colors are better for log fills, which are described in the following section.

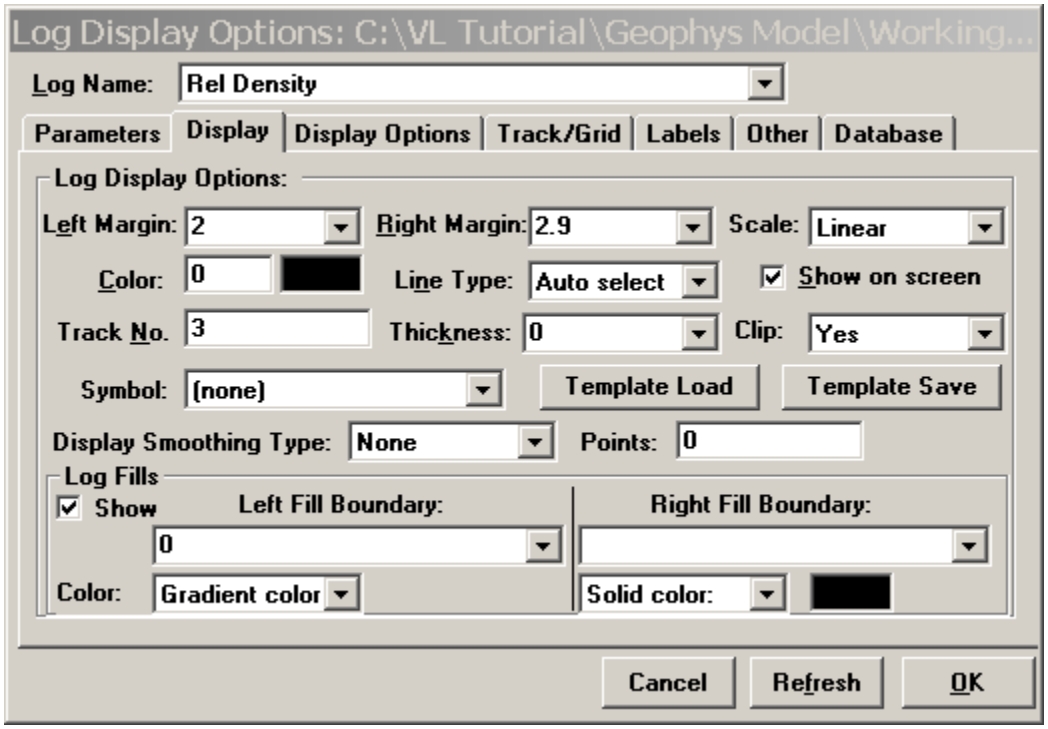
Filling Between Logs

Log Fills can be used to enhance the display of the log data by shading the space between logs, or between a log and a constant value.

TASK: Fill in some of the logs with different colors.

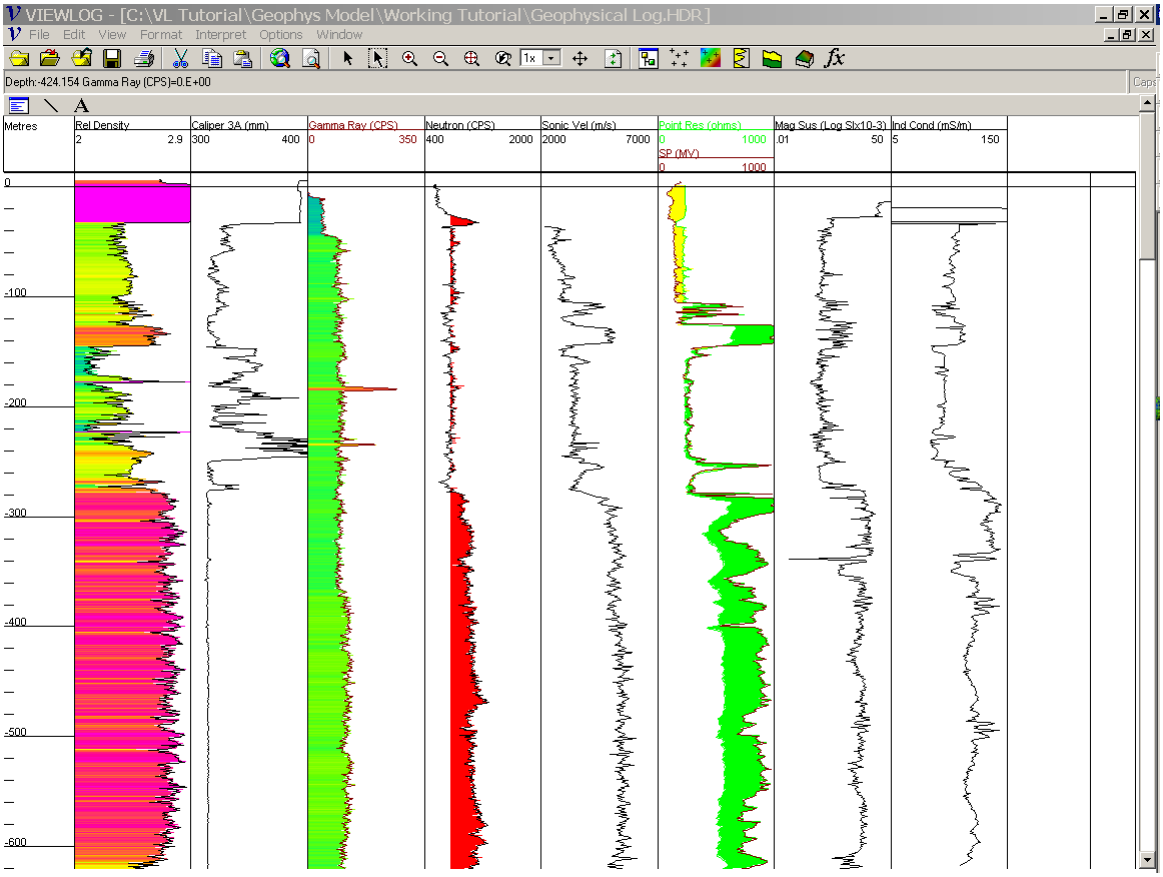
PROCEDURE:

1. Select the **Format/**Log Display menu item, and make sure the **Log Name** is set to Rel Density at the top of the window (see below).
2. The left and right fill boundaries, in which logs and constant values can be specified, control the fills. Logs can be selected by pressing the down arrow beside each **Fill Boundary** box, and then selecting the log name.
3. To set the Rel Density constant value of 0, simply enter 0 in the **Left Fill Boundary** box, as shown above.
4. Make sure to check on **Show** in the **Log Fills** section, as shown in the figure below.
5. For **Color**, select the **Gradient color** option.
6. Repeat the process for Gamma.



The Log Display window for Log fill.

7. To fill between the SP and PR logs, first select the SP from the **Log Name** drop down list box at the top of the window. Check on **Show** in the **Log Fills** section. Select the PR for the **Right Fill Boundary**. Select **Solid Colour** from the drop down menu and choose the color yellow for the fill. In general, bright, or lighter, colors are best for log fills.
8. Next, change the **Log Name** to PR. Check on **Show** in the **Log Fills** section. Select SP for the **Right Fill Boundary**. Select the **Color** green for the fill.
9. Finally, select the Neutron track from the **Log Name** drop down list at the top of the window. Check on **Show** in the **Log Fills** section, and set the **Left Fill Boundary** to 750. Set the **Color** to red.
10. Once all the parameters are set, ensure that the **Show** box is checked on, and then select **OK** to exit. The screen should appear as shown below.



The screen display showing log fills.

Lesson 2: Log Data Correction

An important part of analyzing downhole data is to insure the proper calibration and log corrections have been made to the data. Viewlog encompasses powerful log editing features including function for stretching, smoothing, trimming, re-sampling, averaging and linking logs. Edit data point by point, if necessary.

Correcting Log Depths

Before interpretation, the data must be corrected for depth offset between the logs. Depth correction can be performed two ways:

Editing the log start depth in the Log Display menu

Graphically be depth shifting the logs using the **Edit/**Depth Shift function.

TASK (OPTIONAL): Shift (depth correct) the Gamma log into alignment with the other logs.

> **Note:** In this case, the log does not actually need to be shifted. The procedure outlined below is only to describe the log shifting method.

PROCEDURE:

1. Enter the **Format/**Display List window and click on the Gamma log check box. This will display the Gamma log along with the other logs. Select **OK** to exit.
2. From the menu bar, click on **View/*Zoom In***. Click the left mouse button on the Gamma log at elevation 0 and drag down to an elevation of –100 to zoom in on this area.
3. Select the **Edit/**Depth Shift menu item to switch to the Depth Shift function. The status line should read "DEPTH SHIFT: Press and drag the left mouse button to define the shift.."
4. Click and hold the left mouse button on the gamma log trace at an elevation of -50, then drag the mouse to an elevation of -60. When the mouse button is released, the gamma log will be redrawn at the new depth. Click **Esc** to exit out of Depth Shift mode.
5. The depth correction function may be repeated to refine the log position. To increase depth correction accuracy, reduce the on-screen thickness by using the Zoom functions.

Depth Correcting Multiple Logs

Multiple logs can be depth shifted at one time using the **Edit/**Select Logs menu item.

TASK: Select a group of logs for depth shifting.

PROCEDURE:

1. To select a group of logs, select the **Edit/**Select Logs menu item, and then click on each log trace, or the log name at the top of the data window. The status line will display how many logs are selected.
2. Once logs are selected, select the **Edit/**Depth Shift menu item.

3. Enter the amount of the depth shift in the window and select **OK** to shift the logs.
4. Select the **Edit/**Cancel Current Function (or press **F3**) to unselect the logs.

Log Data Smoothing

Another VIEWLOG editing feature is log-data smoothing. This function is very useful when completed with nuclear logs, which are recorded using a statistical counting process. Two smoothing filters are available: "boxcar" and "taper" weighted moving averages. When using the boxcar filter, each of the n points within the filter zone is equally weighted.

The size of the filter zone is related to the digitization interval. For example, if the log selected for smoothing has a digitization interval of 0.1 m, an 11-point boxcar filter is equivalent to a 1-m weighted moving average (the log value at each depth point represents the average value of the measurements within 0.5 m above and below).

> **Note:** When using the taper filter, the log values near the center of the taper filter are weighted greater than those at the edges. A taper filter will smooth the log less than a boxcar filter of the same size.

TASK (OPTIONAL): Smooth the Sonic Velocity log with a 5-point boxcar weighted moving average.

PROCEDURE:

1. Select the **Edit/**Smooth Logs menu item, and then click on the Sonic Velocity Log trace. The **Smooth Log Options** window will appear, as shown here:

The Smooth Log Options window

2. Select a boxcar smoothing function, and enter 5 points. Select **OK** to perform the smoothing.
3. Once the smoothing is completed, the results will be drawn over the unsmoothed data in a different screen color. Select **Yes** to accept the smoothing results.

Lesson 3: Log Interpretation

The next stage of the tutorial involves adding interpretation to the log data. VIEWLOG provides functions for defining contacts and adding lithologic descriptions to the logs. When the file is saved, all descriptions are stored in the header file for later reference. Key words entered in the text descriptions can be used to create a lithology symbol column.

Log calculations can be user defined by generating processing equations to generate new or corrected logs. The Log calculation function support for a wide variety of mathematical functions (sin, cos, tan, abs etc.), including conditional statements (if then and else) and logical operators (and, or, not). Equations can even be applied to a limited depth interval to correct only portions of the log.

TASK: Set the screen for log interpretation.

PROCEDURE:

1. Select the **Format/**Display List menu item.
2. Place a check in the Interpretation: **Show Set 1** check box.
3. Set the **Track Number** to 12.
4. Select **OK** to exit the Display List menu. A single blank column should appear on the right side of the screen.
5. The new interpretation track will not have a title. Move your cursor over to the new interpretation track and right click, choose attributes. This will display the interpretation text format for the track.
6. Under **Display Options/*Name*** type in “interpretation”.

Adding Contact Lines

Geologic contacts, or marker lines, can be placed on the log data in the **Interpret/**Contacts menu item. Contacts are added by pointing within an interpretation column and pressing the left mouse button, and removed by pointing at the contact and pressing the right button.

TASK: Place contact markers at an elevation of –247 meters.

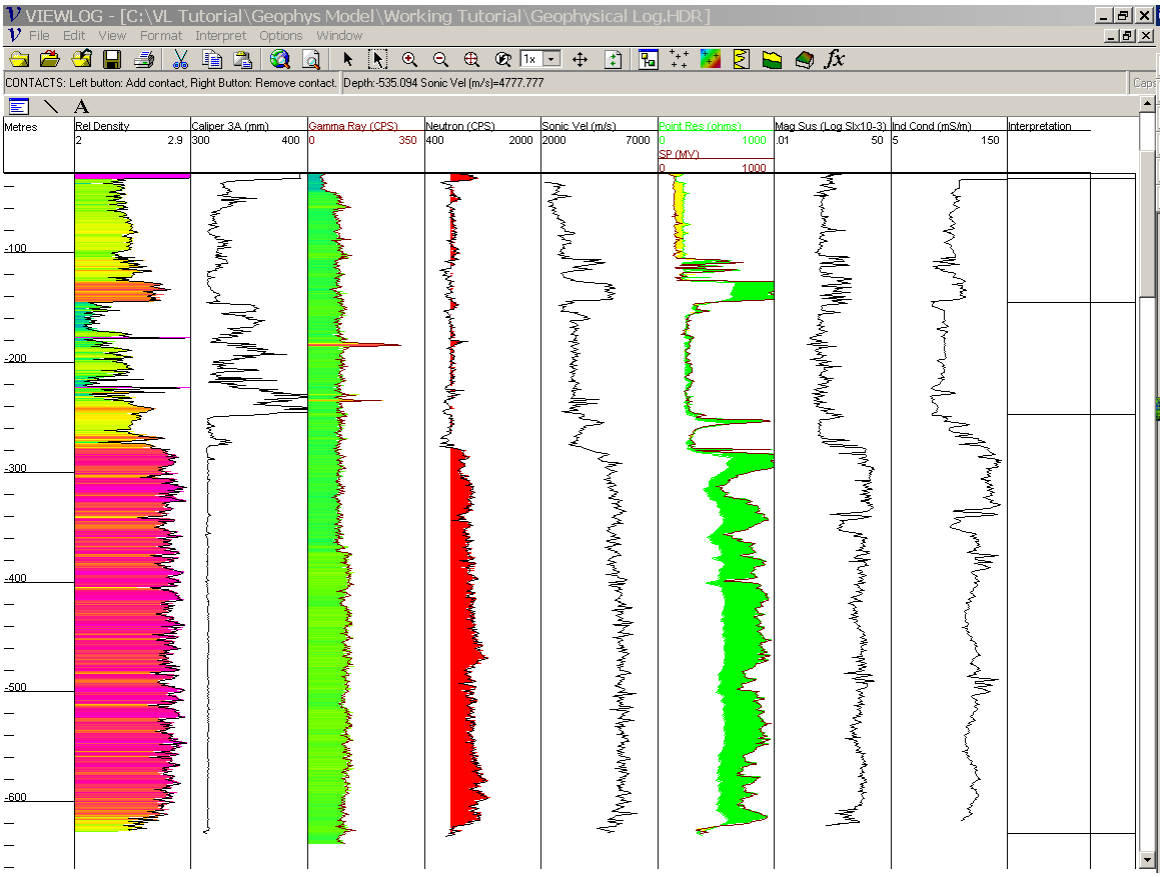
PROCEDURE:

1. Select the **Interpret/**Contacts menu item.

> **Note:** Once you have done this, the status bar in the upper left corner of VIEWLOG will remind you that you are in “CONTACTS” mode.

2. While pressing (and holding) the left mouse button within the blank right column, adjust the elevation of the mouse cursor to -247 metres. The Depth will be displayed on the status line beneath the main menu bar. When the depth is reached, release the button to place a contact marker line.
3. If necessary, a contact may be removed by pointing at the contact line (make sure you have selected the **Interpret/**Contacts menu item, and that you are in “CONTACTS” mode, as noted in the upper left corner of the VIEWLOG window), pressing the right mouse button. All depths are recorded into memory and are stored to disk when the file is saved.

4. Repeated the process by adding more lines at: ~0m, -34m, -144m and –611m.



Screen display following the addition of a contact line.

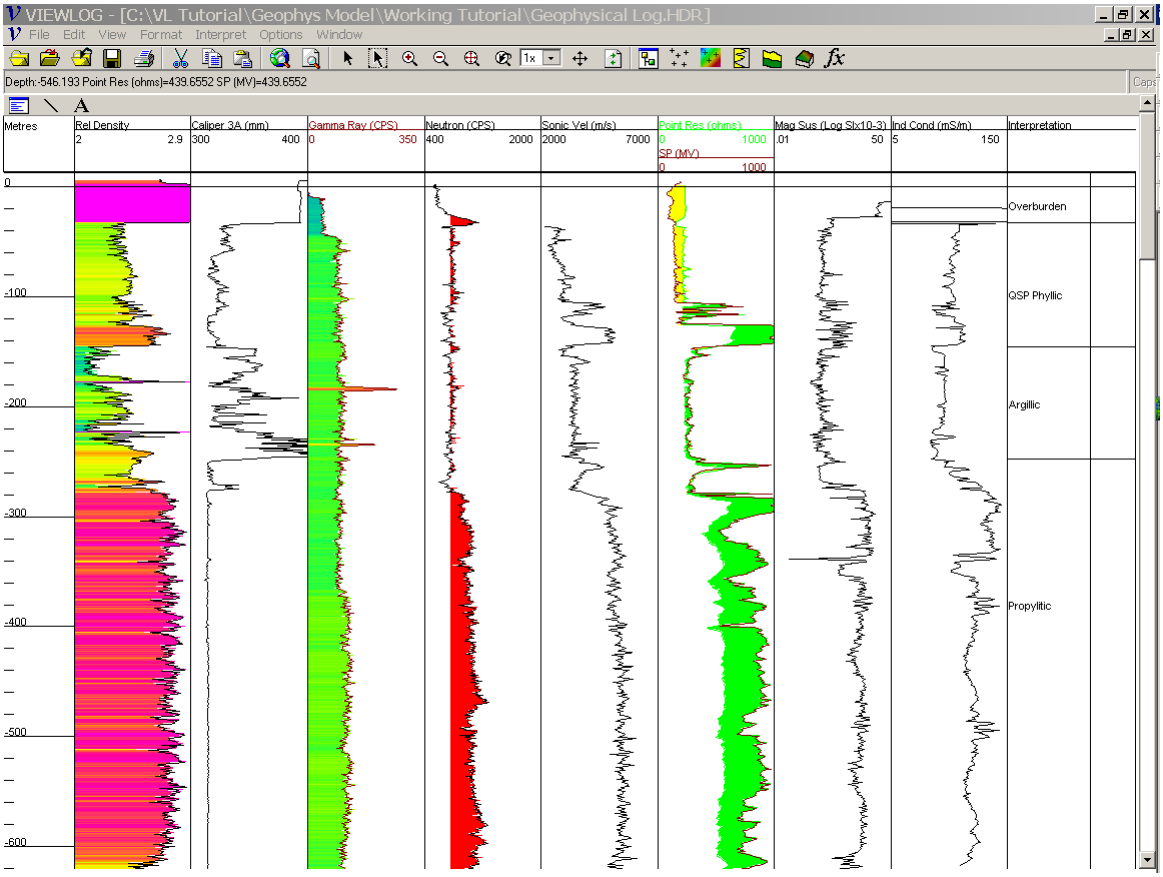
Adding Interpretation Text

A similar procedure is used to add text descriptions to the log data. Text messages are added at specific depths, and are independent of the contact lines. Text messages are added with the left mouse button, and removed with the right button.

TASK: Label the defined contacts.

PROCEDURE:

1. Select the **Interpret/**Text Description menu item.
2. Press the left mouse button while pointing within the text column at a depth of approximately -16 meters. The program will display a text input box at this location, so type "Overburden" and Press **Enter** to complete the task.
3. Repeat the process by clicking the left mouse button in the middle of the next unit and enter the text "QSP Phyllic". The next unit will be “Argillic” and the bottom unit, “Propylitic.”
4. Press **Esc** to cancel the current function. Upon completion, the screen will appear as shown below. Save the log.



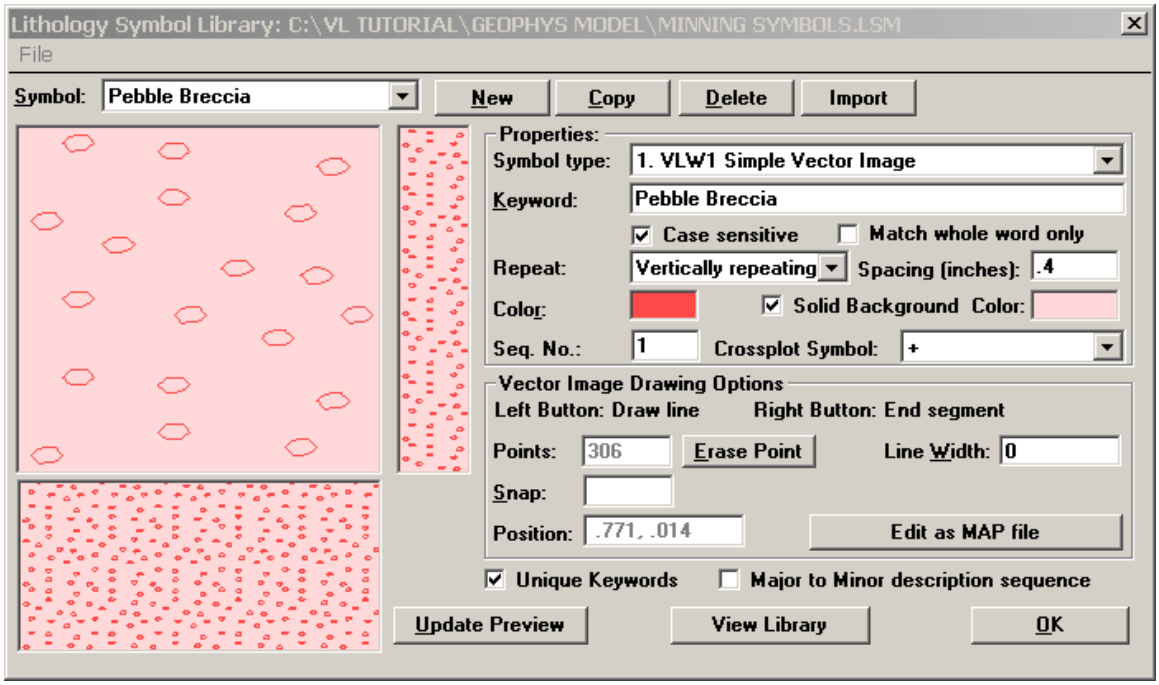
Screen display showing Text Interpretation.

> **Note:** The **Ctrl-Click** and **Shift Drag** mouse operations can be used to edit or depth-shift an existing text message box.

Adding Lithology Symbols

The interpretation text can be connected to geologic units in the Lithology Symbol Library, such that the different units are filled with different symbols. By entering interpretation text that contains keywords, VIEWLOG will search the lithology library, and subsequently fill the unit with the appropriate symbol. VIEWLOG has two default Lithology libraries: VIEWLOG.lsm (Default) and VIEWLOG MINING SYMBOLS.lsm. Both these libraries can be found in the tutorial directories and in the main program directory.

The **Options/*Lithology Symbols*** menu, shown below, provides functions for the user to draw custom lithology symbols. For more information, see Lithology Symbol Editor.



The Lithology Symbol window.

> **Note:** Clicking on the down arrow beside the **Symbol** will display a list of the currently defined symbols. To display lithology symbols along side the text description, simply check the Litho box in the **Format/**Display List window. As long as the geologic you entered as interpretation text is found in the keyword list in the **Lithology Library,** the symbol will be shown on the log.

TASK: Change from the VIEWLOG default library to the VIEWLOG mining symbols library.

PROCEDURE:

1. Choose **Options/*Lithology symbols*** to open the Lithology Symbol Editor.
2. Choose **File/*Open Library***. Click on No to save the changes in the currently open library.
3. Choose Mining Symbols.lsm from the main tutorial directory. C:/VL Tutorial/Geophys Model.
4. Click **OK** to close the window and choose **No** to save any changes.

Performing Log Calculations

The **Interpret/**Log Calculations menu item is used to perform log calculations in VIEWLOG. Equations are entered in a similar manner to a spreadsheet, allowing a high degree of flexibility.

TASK (OPTIONAL): Correct the gamma log by adding a constant value of 100.

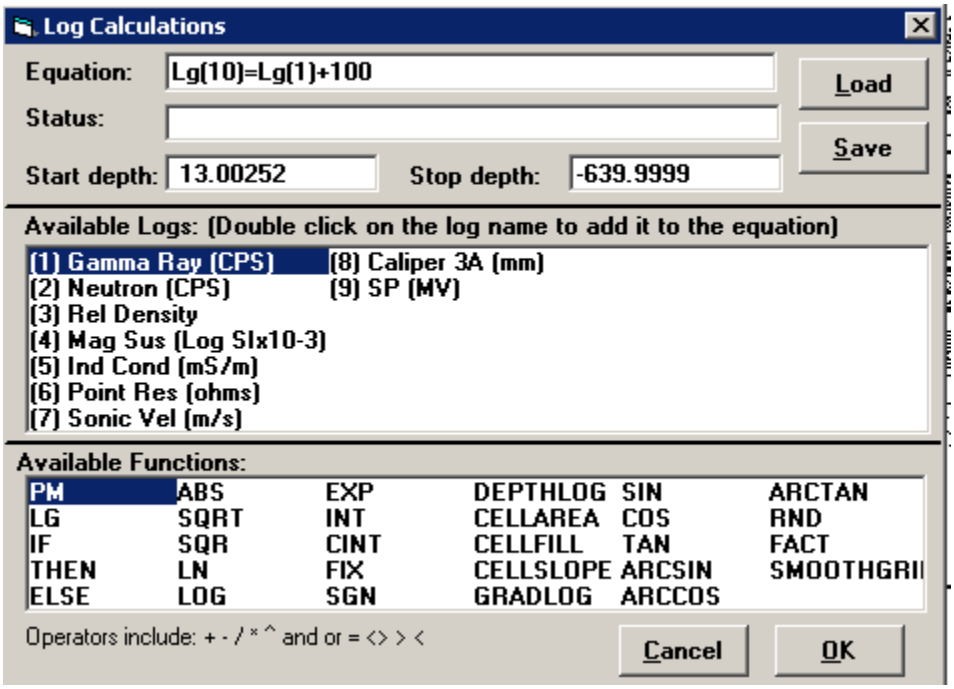
> **Note:** In this case, the data does not actually need to be corrected; the purpose of this task is to show you how to correct the data should it be necessary. In this example, this could represent a baseline shift due to instrument error.

PROCEDURE:

1. Select the **Interpret/**Log Calculations menu item.
2. Click once on the Gamma log to select the entire depth range for processing.

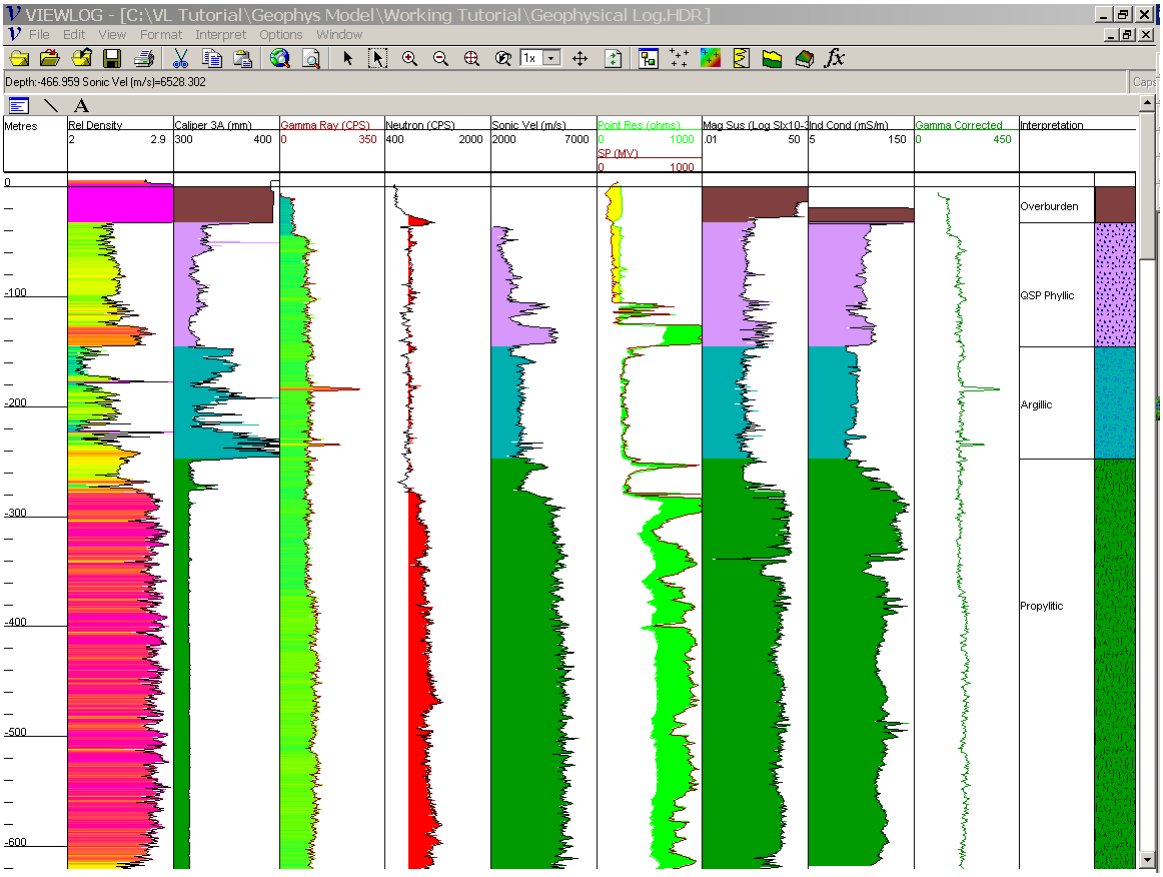
> **Note:** To process only a limited depth interval, click and drag in a manner similar to zooming.

3. Once the depth range is defined, the program will enter the Log Calculations window as shown below.



The Log Calculations window.

4. To convert the gamma log, enter the formula exactly as follows: LG(10) = LG(1) + 100 in the Equation line. This will create a new log by adding 100 to the existing Gamma log.
5. Select **OK** to perform the calculation. Errors in the equation will be indicated with an error message in the Status box.
6. Once processing is complete, the program will redraw the screen.
7. Select **Format/**Display List to review the log display parameters for the new log, which, by default, is called "Calc. Log". Change the Calc Log display parameters to show a log range of 0 to 500, and make sure that it is displayed. Move the Text Interpretation Set 1 to Track 13, and move the Calc. Log to Track 12. You may need to reset the scale (left Margin to 0 and Right Margin to 450)
8. To rename the Calc. Log, select it by double clicking. In the **Log Display Options** window, click on the **Parameters** tab and change the **Log Name** to: Gamma Corrected. Click on **OK** to close the **Log Display Options** window (See below).



Final Log Calculation results.

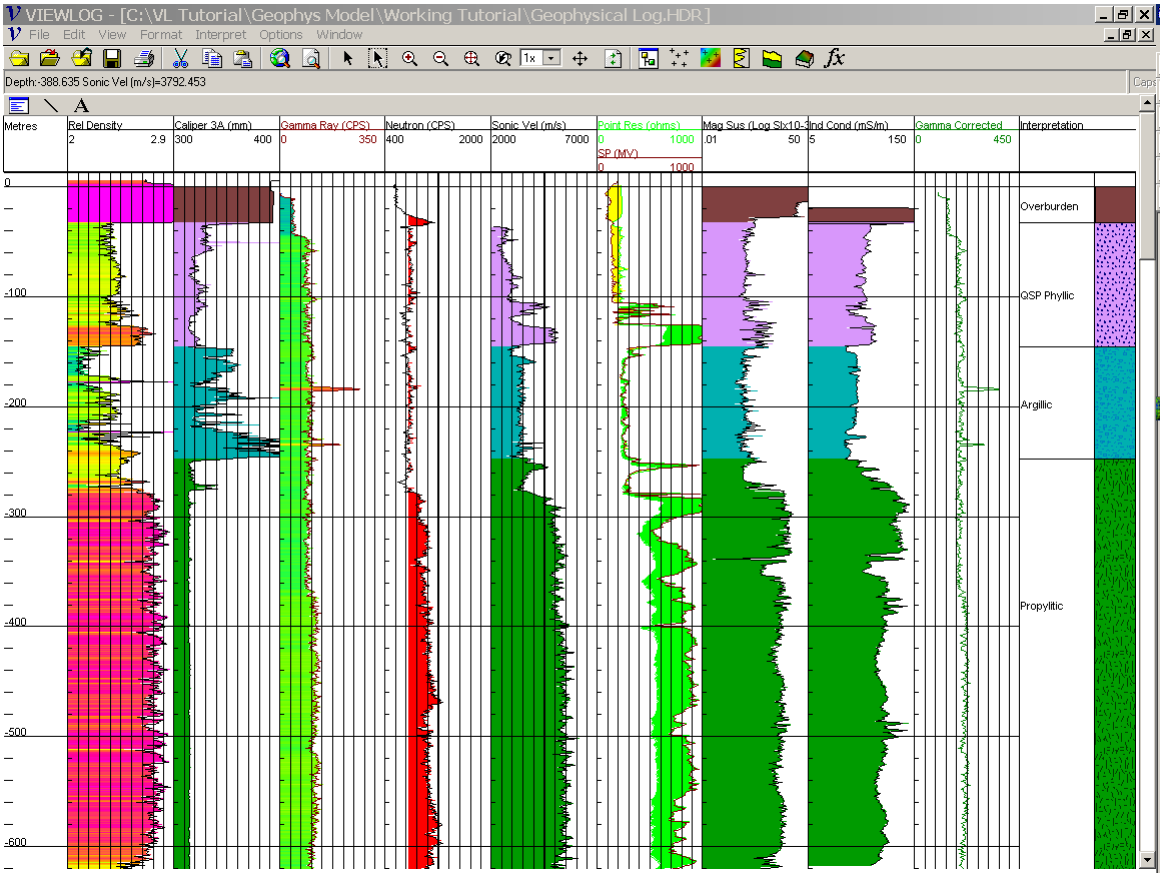
Adding Grid Lines

It can be very important to display grid lines in the individual tracks.

TASK: Add API grid lines.

PROCEDURE:

1. Right click on any of the existing log tracks, and select **Attributes**.
2. Select the **Track/Grid** tab.
3. In the Default Track Settings (all logs) section, uncheck the **Suppress all grid lines** checkbox and place a check in the **API Format Grid** checkbox.
4. Click on **OK**.
5. Change the grid, label and tick increments to 25, 25, and 25, respectively, by selecting the **Format/**Depth menu item, and selecting the **Labels and Grid** tab. Your logs should resemble those shown below.



Logs with Grid Lines.

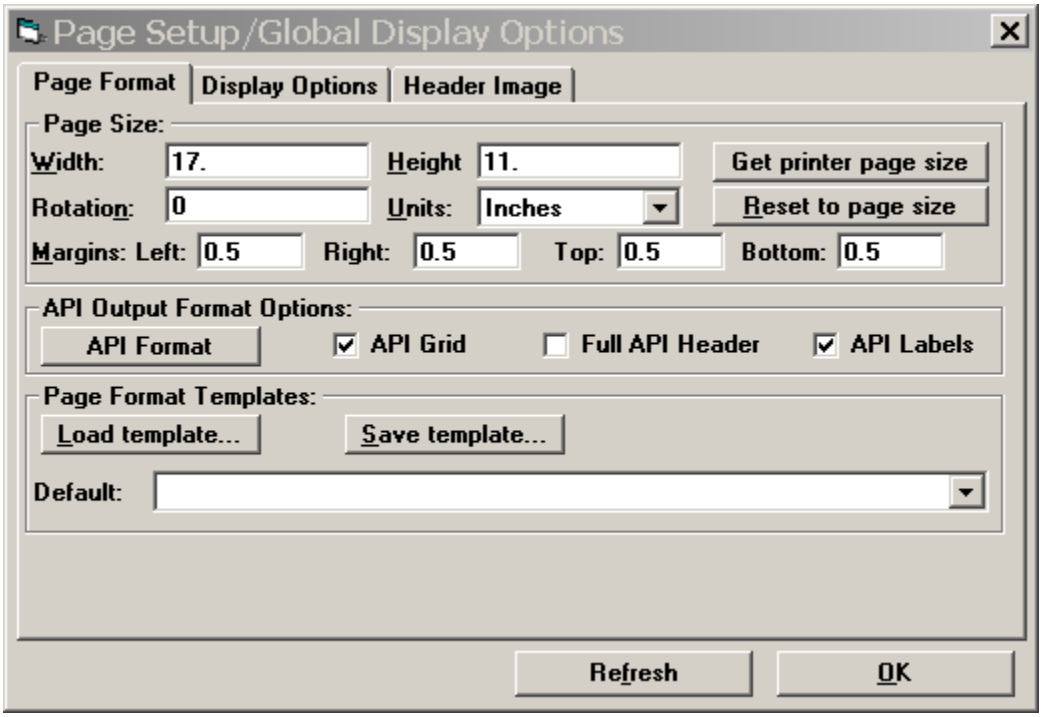
Producing Log Data Output

When printing logs, VIEWLOG utilizes the current log scaling parameters as the default format. This simplifies output, as setting up the screen to display the logs, depth and scaling parameters is equivalent to setting the output format.

TASK: Create a paper copy of the logs.

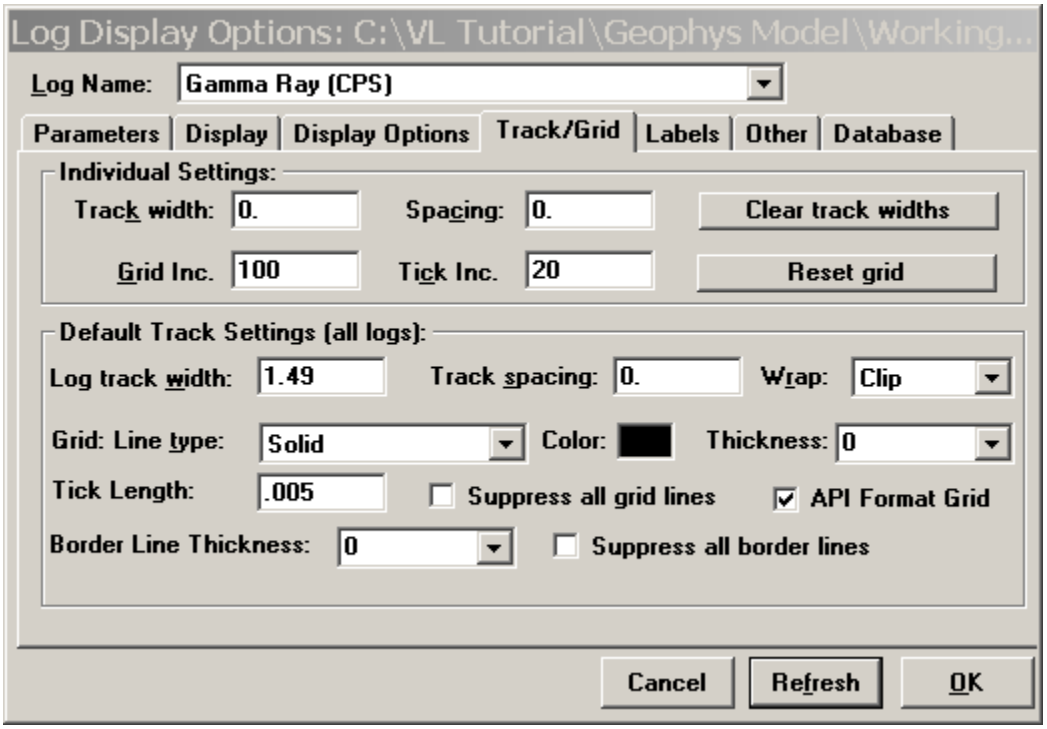
PROCEDURE:

1. Begin by selecting the **View/**Zoom All menu item, thereby showing the entire well on screen.
2. Select the **Format/**Page/Global Settings menu item. This window controls the overall format of the plot. Most important are the **Page Size, Width** and **Height** parameters. To have VIEWLOG select default format values for a landscape mode plot, enter a **Page Width** of 17 and **Page Height** of 11 inches, as shown in the figure below. Click **Refresh**.



The Page Setup/Global Display window.

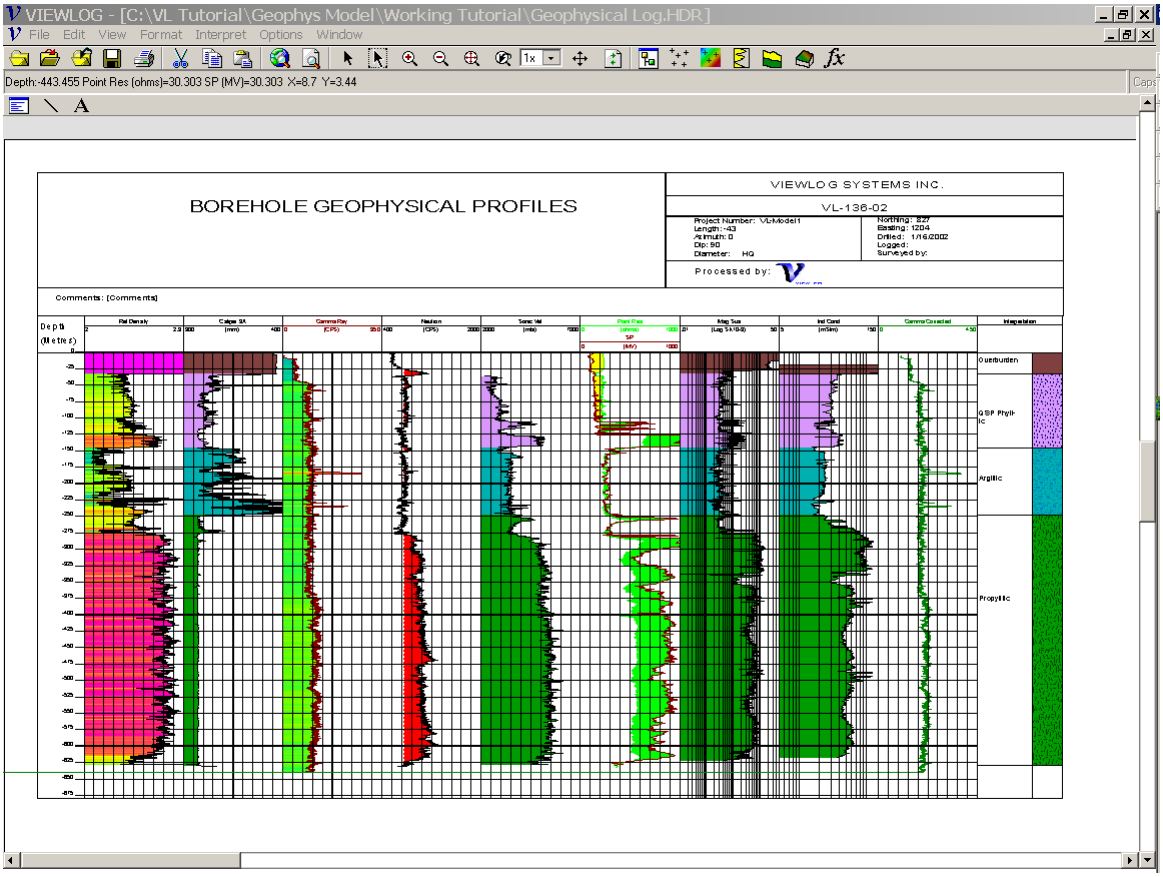
3. Select the **Header Image** tab and select C:\VL Tutorial\Geophys Model\MasterHeader_ 11X17.map. Click on **In Line Image**. Click **OK** to return.
4. Select the **Format/**Depth menu item, and make sure the **Fit to depth column length** check box is unchecked. Set **Start** to 0 and **Stop** to –680 and the **Scale** to 1:4000 for **Print and Preview mode.**
5. Select **OK** to return to the main menu.
6. Right click on any of the geophysical tracks to open the **Attribute** menu. On the **Track/Grid** tab change the **Default track width** to 1.49 as shown below.
7. Select **OK** to return to the main menu. Save the log.



Set Track Width.

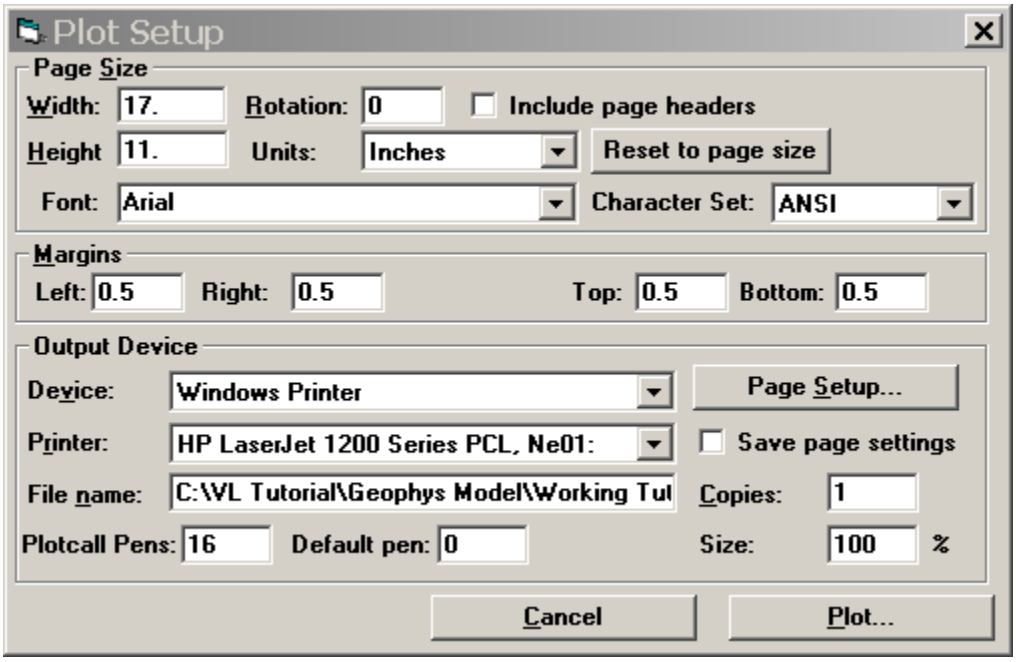
8. Select the **View/**Preview Mode menu item to have VIEWLOG draw an exact representation of the plot on screen (see below). While some log editing and interpretation functions are not available in Preview mode, all the **Format** menu functions can be used.

> **Note:** The zoom and pan functions continue to operate, and that double clicking on a log trace, header or depth track will load the appropriate format menu window.



Log output preview mode.

9. To create the plot, select the **File/**Print menu item to load the **Plot Setup window** (see below). Click on the **Page Setup** button to change the page orientation to Landscape mode. If the configuration is acceptable, select **Plot** to send the output to the printer.



The Plot Setup window.

Saving Changes and Exiting Viewlog

To save you tutorial changes, select the **File/**Save As menu item, enter a new filename (i.e., tutor2.hdr), and press **OK.** Make sure that you are saving to the C:\VL Tutorial\Geophys Model directory. To exit VIEWLOG, select the **File/**Exit menu item.

Lesson 4: Introduction to Geologic Database Management

The database connectivity functions in VIEWLOG provide powerful tools for interacting with information stored in an open database structure.

This chapter provides an introduction for VIEWLOG users. Depending on which version of VIEWLOG you are using, it is a good idea to cover the first five tutorials before continuing.

Creating a Query in MS-ACCESS

Because the borehole locations and the borehole depths are stored in different tables, we need to create a database query that combines fields from each of these tables.

TASK: Create a simple query in MS-ACCESS.

PROCEDURE:

1. Open the C:\VL Tutorial\Geophys Model\Geophys Model.mdb in MS-ACCESS.

> **Note:** This database is in MS-ACCESS version 2000. If you require a different version of the database, please contact VIEWLOG systems.

2. Before we begin to create a query, we will give us the core descriptions for the drill holes.

   Project: Exploration Project ID

   Master_Location: XYZ Location Information

   Master_DrillRig: Drill Rig Information

   Master_DrillMotion: Drill in motion information

   Master_DrillHole: Downhole Geophysical Drillhole Logging Information

   WireLine_Data: Downhole Geophysical Data

   Geo_Description: Geological Hand Sample Information

   Lab_Sample: Hand Sample Lab information

   Lab_Assay_Data: Downhole Assay Information

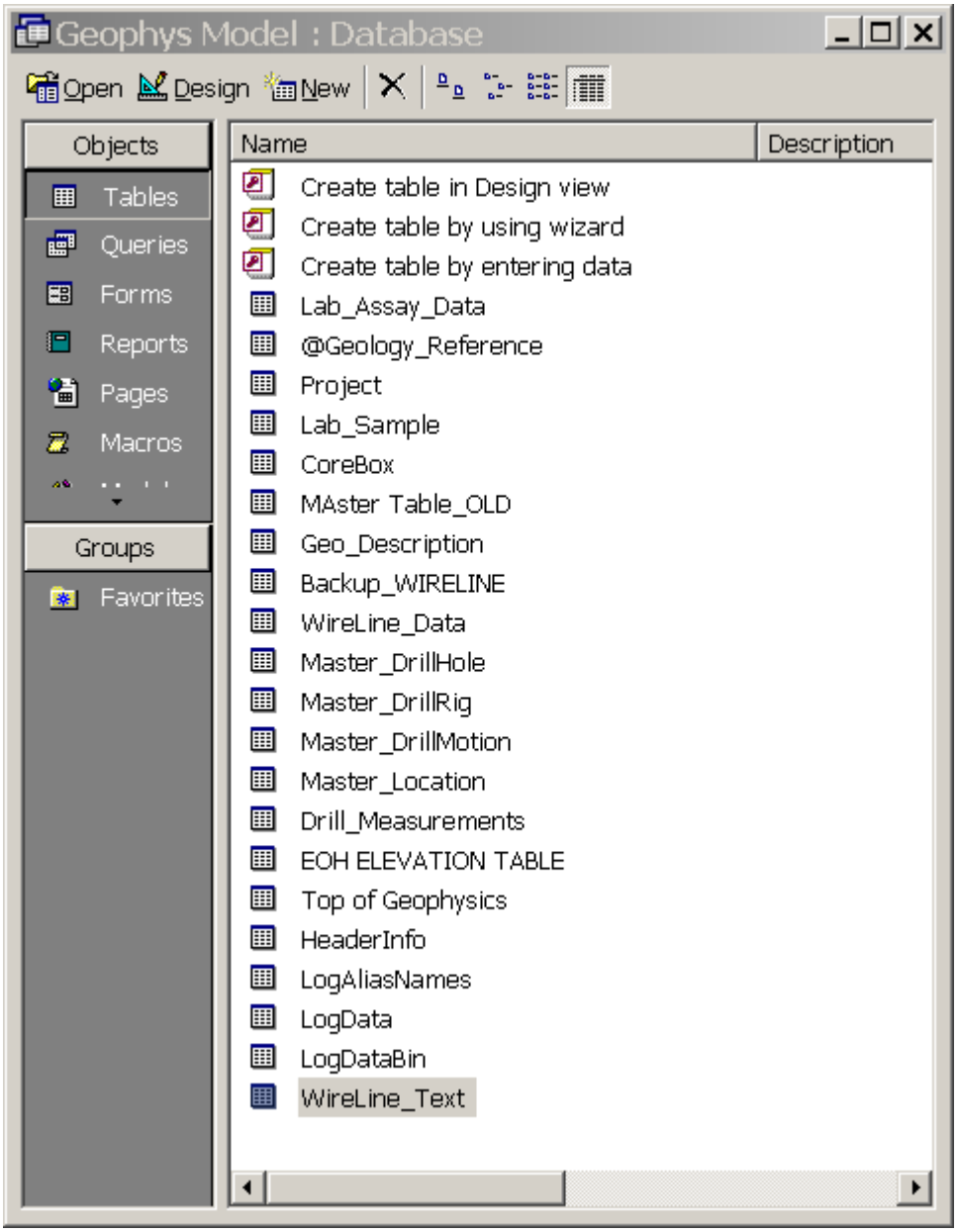
   CoreBox: Core Box Information

   WireLine_Text: Geophysical Interpretation for downhole Data

   @Geology_Reference: Geology References

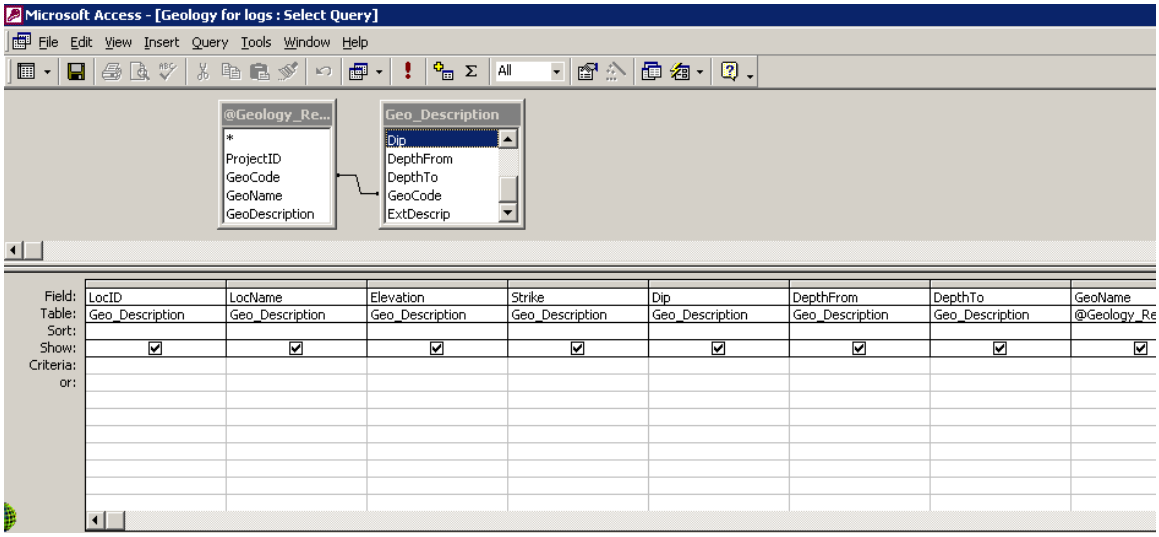
> **Note:** To view a description of the different fields within each of these tables, you can view each table in design mode by clicking on the desired table, followed by the icon.

3. Create a new query by clicking on the **Queries** button and selecting **New**.



Creating a Query in MS-ACCESS.

4. Select **Design View** and click **OK**.
5. You will be prompted with a **Show Table** window. You can select which tables you want to include in this query. Select Geo_Descriptions and @Geology_Reference by double clicking on these tables. Close the **Show Table** window.
6. Link the Geo_Code field in both tables by clicking Geo_Code in one table, and dragging and releasing the left mouse button onto the Geo_Code field in the second table. You will see a black line that connects these two fields (see below).



Fields are added to the query by double clicking in the selected tables.

7. Add the following tables to the query in this order (order is important because it will make the use of this query much simpler in VIEWLOG):

   LocID (from Geo_Description)

   LocName (from Geo_Description)

   Elevation (from Geo_Description)

   Dip (from Geo_Description)

   DepthFrom (from Geo_Description)

   DepthTo (from Geo_Description)

   GeoName (From @Geology_Reference)

8. Save the query as Geology for Logs. You can see what the query looks like by clicking on the icon.

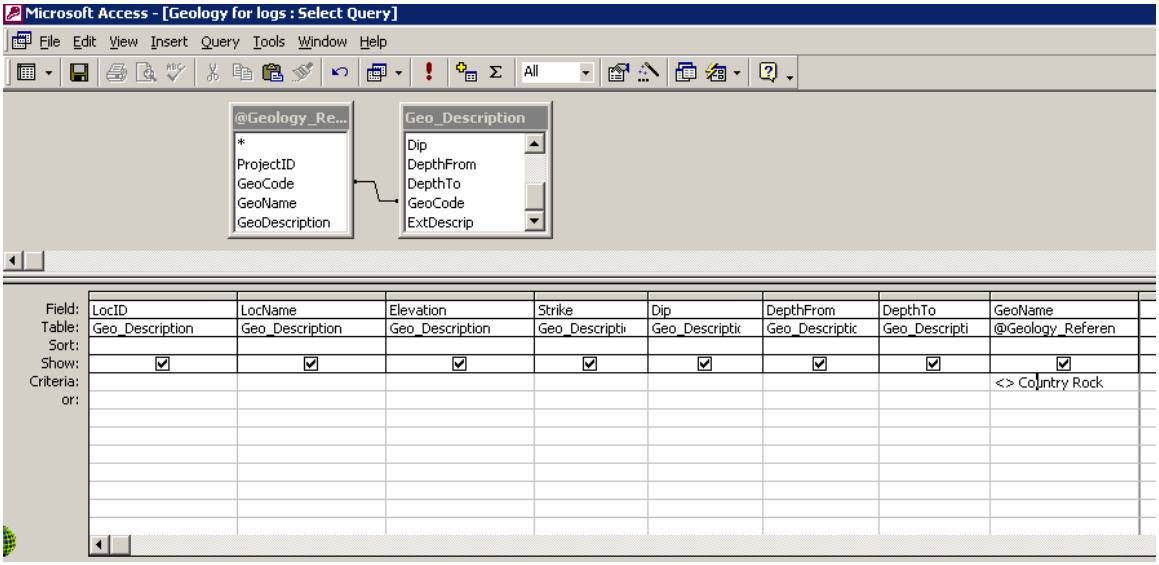
Filtering a Query

For the Geology for Logs query we just created in the previous task, we will add a filter, to exclude boreholes that do not have top or bottom elevations.

TASK: Filter a Query.

PROCEDURE:

1. Open the Geology For Logs query in **Design View**.
2. In the Criteria row, under GeoName, add “<> Country Rock”. This will eliminate “Country Rock” sample out of our query.



Filtering a query in MS-ACCESS.

Lesson 5: Connecting to the Log Database

Why Connect the Log Editor to the Database?

Previous sections of this manual have outlined methods for completed with data in the Log Editor. In those examples, both the data and related display parameters are stored in the HDR file structure. This works well for "stand alone" file management, but it is not ideal for dealing with large numbers of wells. For those situations, database connectivity becomes essential.

To address this issue, the Log Editor can be connected directly to a database. In this situation, no data is stored in the HDR file, and the HDR parameters are used, instead, as a template for formatting the borehole information as it is extracted from the database. Each log or interpretation column is linked to the database table or query, so that when the HDR file is opened VIEWLOG automatically extracts the required well data from the database.

The key to interpreting multi-parameter borehole data is data integration. It is truly a multivariate data set with varying correlations between physical parameters for different lithological units. Spreadsheets and most graphical display packages are primarily 2-dimensional, whereas geophysical borehole data, is 4-dimensional (x,y,z position and physical parameter). To achieve easy access to data in a multi-well, multi-parameter setting requires construction of a relational database. In this type of setting it becomes relatively simple to test hypotheses on the basis of physical property, depth, location, or any combination of parameters.

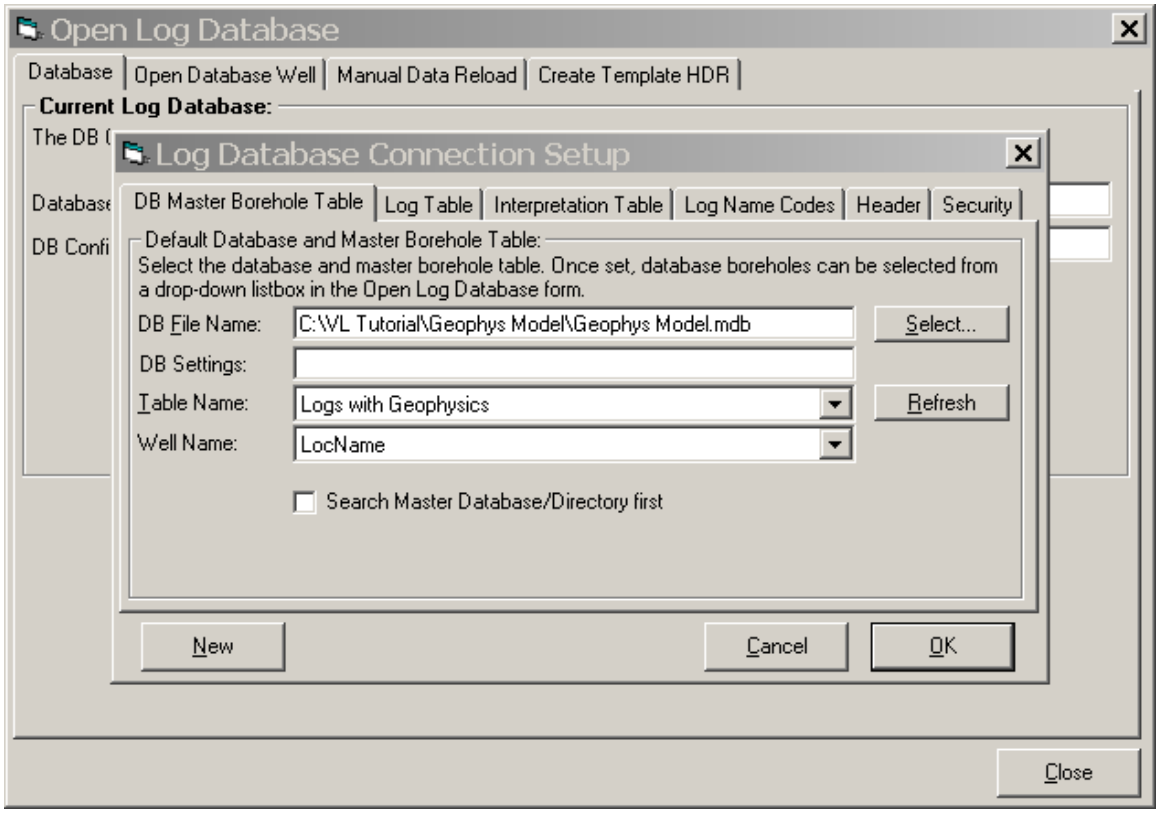
Creating a DB Configuration File

TASK: Link the Log Editor to the database and create a DB configuration file.

> **Note:** By creating a DB configuration file, VIEWLOG will remember all the settings, linking the tables and queries in the user-defined manner.

PROCEDURE:

1. In VIEWLOG, select **File/**Open Log Database**.** The **Open Log Database** menu is formatted with four-tab menu.
2. Select the **Database** tab
3. Select **Configure Default Database Connection Settings**. This will now bring up the Log Database Connection Setup menu with a six-tab menu (see below).



Log Database Connection Setup Menu.

Log Database Connection Setup: DB Master Borehole Table Tab

TASK: Start with the **DB Master Borehole Table** tab.

PROCEDURE:

1. Select the **DB File Name** C:\VL Tutorial\Geophys Model\ Geophys Model.mdb.
2. Select the **Table Name** from the drop down menu to “Logs with Geophysics”.
3. Select the **Well Name** from the drop down menu to “LocName”

Note: You may have to click on the **Refresh** button.

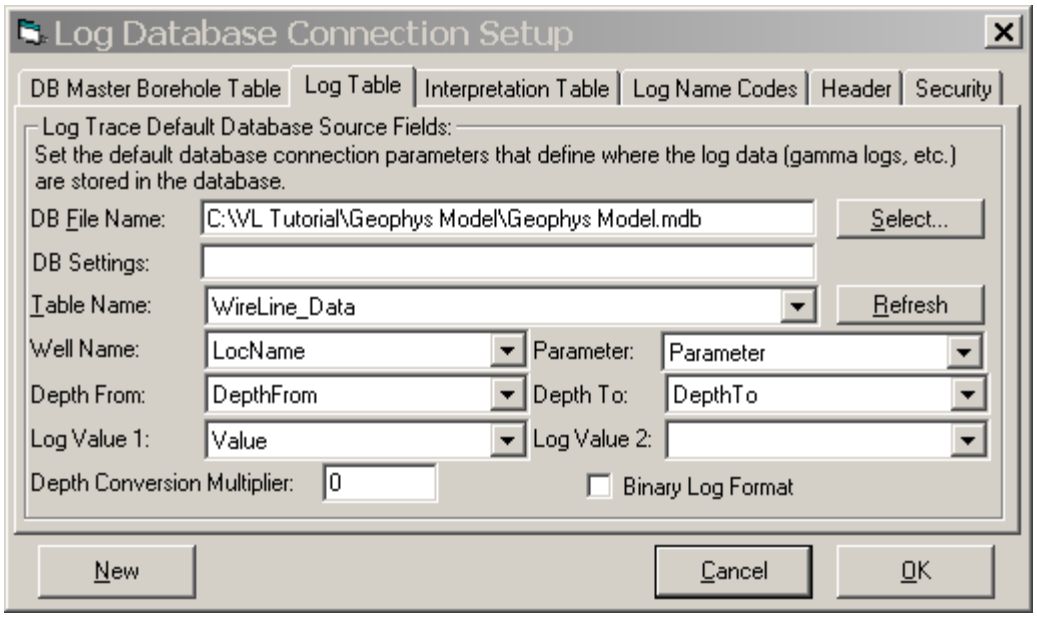
Log Database Connection Setup: Log Table Tab

TASK: Complete the **Log Table** tab.

PROCEDURE:

1. Select the **DB File Name** C:\VL Tutorial\Geophys Model\ Geophys Model.mdb.
2. Select the **Table Name** to “WireLine_Data”.
3. Fill out the rest of the table, as shown in the figure below.

Note: Make sure the **Binary Log Format** box is unchecked, otherwise the menu will appear quite different. For more information on uploading log files in binary format, please refer to the VIEWLOG Reference manual.



Log Data Connection Setup – The Log Table Tab.

Log Database Connection Setup: Interpretation Table Tab

TASK: Complete the **Interpretation** tab, and select the appropriate DB file name.

PROCEDURE:

1. Set the **Table Name** to “Geology for Logs”, and then select **Refresh**.
2. Set **Well Name** to “LocName”.
3. Leave **Parameter** Blank.
4. Set **Depth From** to “DepthFrom”.
5. Set **Depth To** to “DepthTo”.
6. Leave **Text Depth** blank.
7. Set **Text** to “GeoName” and select **OK**.
8. Select **Save DB Configuration** and save it as Porphyry Model.db

Creating Template HDR Files

When using the Log Editor with a database, the first task is to select a well for use in setting up the display template settings. Typically, it is best to choose a well with detailed information. By selecting a representative well, it is easier to format and configure the log display.

Once the well is selected, a new HDR file is created. The unique well name or ID number is then entered in the Wellname Field in the Log Editor. This is critical because VIEWLOG will use this value to extract information from the database.

TASK: Create a Template HDR File.

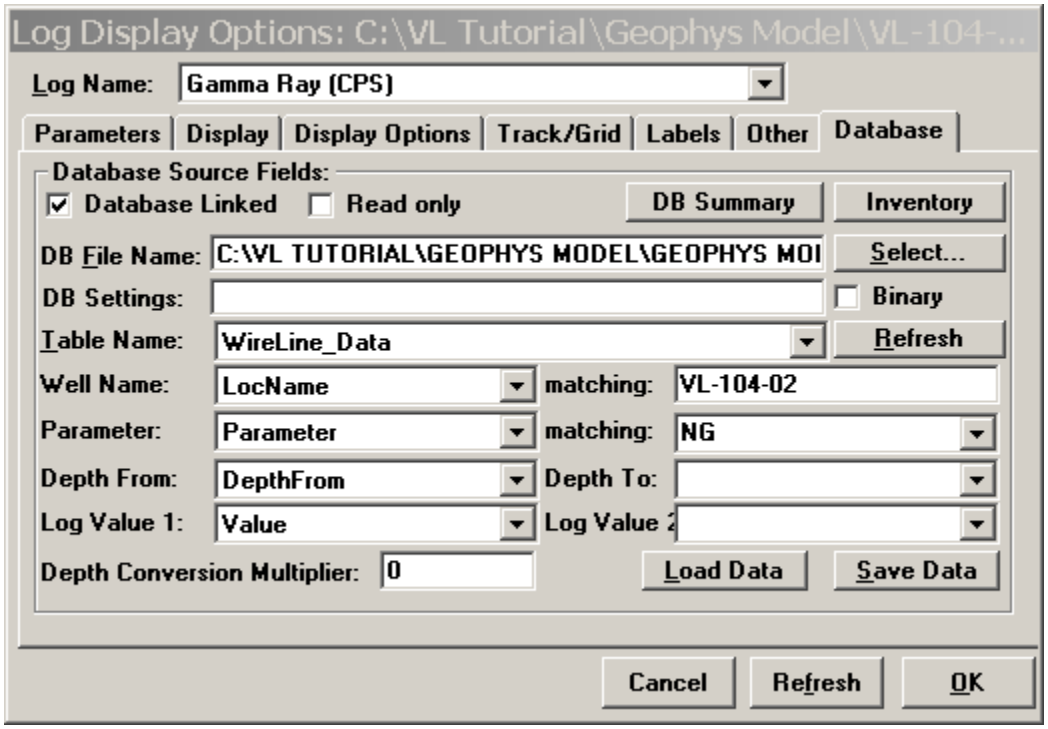
> **Note:** As mentioned in previous sections, it is very important to set up Log Templates, either for cross section or Log Presentations. In this task, we will create a Template HDR file for displaying the Geophysical Logs. Alternatively the completed template can be use C:\VL Tutorial\Geophys Model\Completed Tutorial\Geophysical Template.HDR.

PROCEDURE:

1. Select **File/**New Log File. You should see a blank log file, which displays only a depth track.
2. Select **Edit/**Create New…
3. Select **Uneven Depth Spacing Log**
   a. Repeat this process five more times to create a total of 6 new tracks.
4. Right-click on the furthest left track, and select **Attributes.**
   a. Use the **Log Name** bar at the top of the window to select the first track.
   b. Change the **Log Name** to Gamma
   c. Repeat this procedure for the other logs, which you would like to see displayed.

> **Note:** For this tutorial will create 8 more tracks; Density, Neutron, Caliper, SP, PR, Sonic Velocity, Magnetic Susceptibility, Inductive Conductivity.

   d. Click on **OK**.
5. Select the **Format/**Display List menu item (or select **F11**) to activate the Display List window.
   a. Change the Track Number for Gamma to 3, Density to 4, Neutron to 5 etc.
   b. Click on **OK**.
   c. Right click on the Gamma Log, and select **Attributes** (right click with the mouse in the track window).
   d. Select the **Database** tab.
   e. Check on **Database Linked** and **Read only**.
   f. Hit **Refresh**, and fill out the table as shown in the figure below.



Log Display – The Database Tab.

6. Repeat the process for the remaining tracks. The only item that needs to be changed is the matching field, which should be changed to NN (Natural Gamma), DC (Density), MS (Magnetic Susceptibility), SP (Spontaneous Potential), PR (Point Resistance), CT (Caliper), IC (Inductive Conductivity) and AV (Sonic Velocity). respectively.

> **Note:** Make sure the **Database Linked** check box has been checked on for each track.

7. Click on OK to close the Display Options window.

Formatting the Template

1. Open the **Format/**Page/Global Settings menu item.
   a. Make sure the width and height of the page are 17 and 11 inches, respectively
   b. Click the Header Image Tab and select C:\VL Tutorial\Geophys Model\MASTERHEADER_11x17.map for the file.
   c. Make sure In-line image is checked.

> **Note:** For more information on how to create a Header map see below.

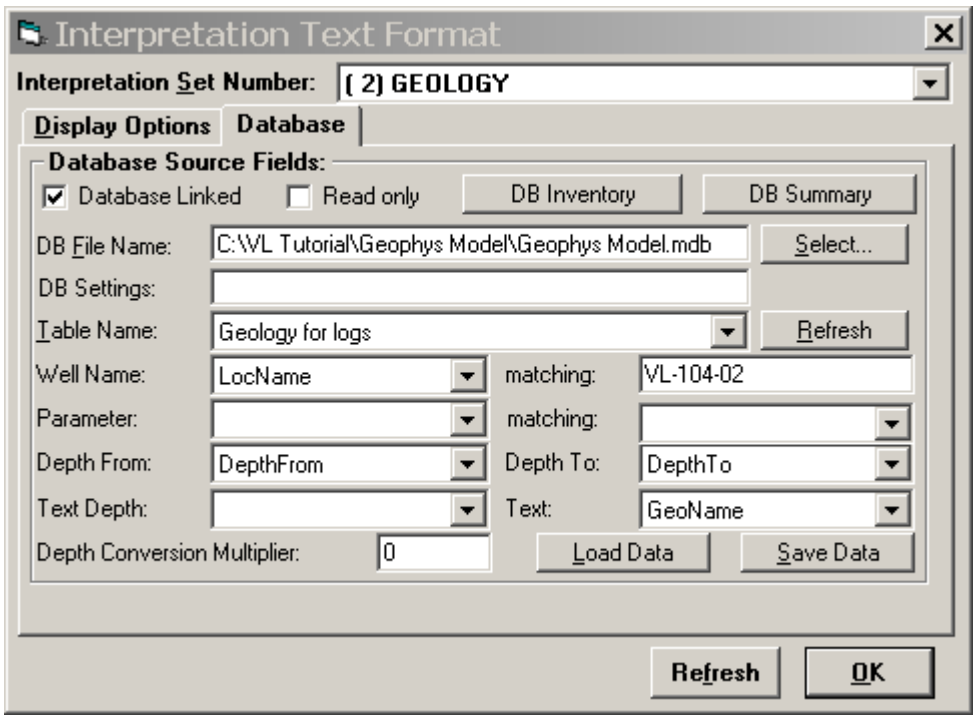
   Close the window by clicking on **OK**.
2. Right click on any track again, and select **Attributes**.

In the **Track/Grid** tab, On the **Default Track Settings** (all Logs), type in 1.4 for the log track width. This will ensure that the track width for all the logs lines up with the report header (see above).

Change the **Track Spacing** to 0.3.

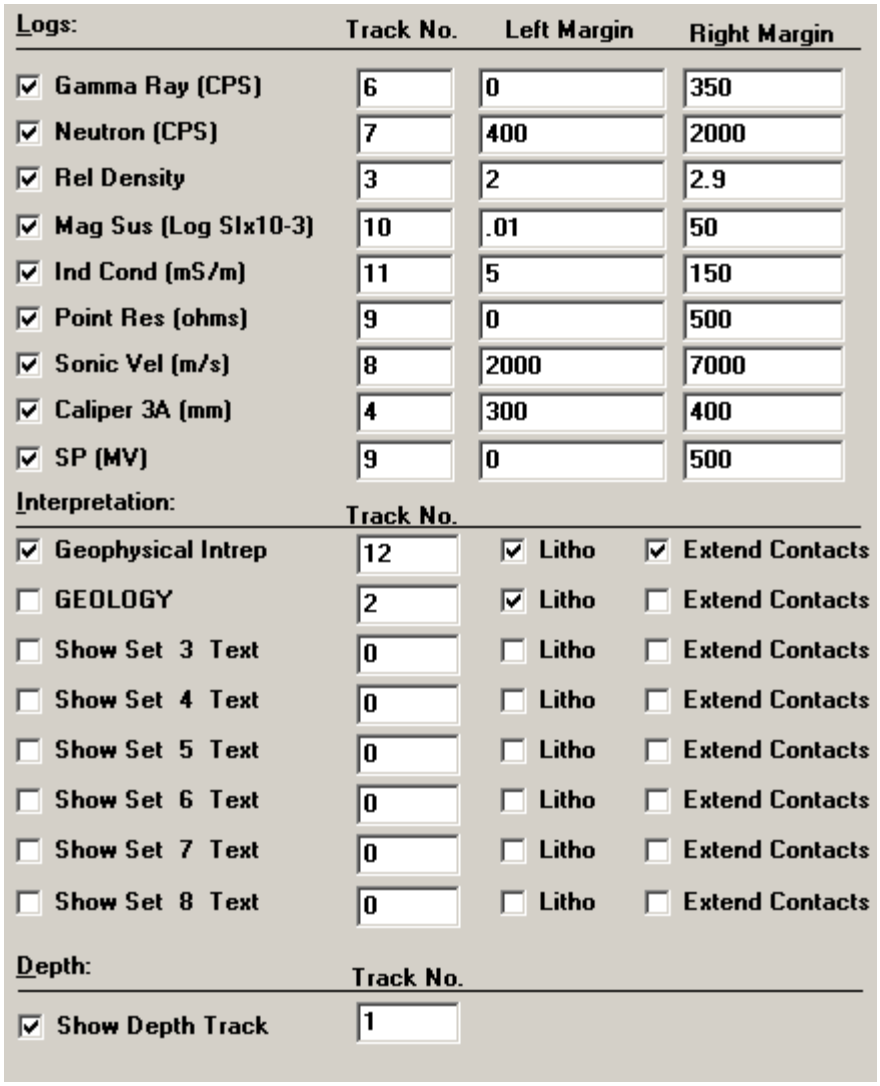
Inserting an Interpretation Column into the Template

1. To add a column that includes geology (or any interpretation), select **Edit/Create New…/**Text/Litho/Photo Column
2. Right click in this new column, and select **Attributes**.
   a. In the **Display Options** tab, change the Name to Geology
   b. In the **Default Settings,** change the **Text size** to 0.2, the **Track width** to 0.83 and the **Litho column width** to 0.44
   c. Select the **Database** tab, and place a check beside **Database Linked** and **Read only**
   d. Choose the DB File Name as C:\VL Tutorial\Geophys Model\Geophys Model.mdb and click on **Refresh.**
   e. Fill out the rest of the window as shown below.
3. Select **F11** to enter the Display List menu or choose **Format/**Display List, and place the Geology log in track 2.



The Database Tab for the Aquifers track.

4. Keep the Display List menu open and change the left and **Right Margins** as shown below:


Logs:
Track No.
Left Margin
Right Margin
Gamma Ray (CPS) 6 0 350
Neutron (CPS) 7 400 2000
Rel Density 3 2 2.9
Mag Sus (Log SIx10-3) 10 .01 50
Ind Cond (mS/m) 11 5 150
Point Res (ohms) 9 0 500
Sonic Vel (m/s) 8 2000 7000
Caliper 3A (mm) 4 300 400
SP (MV) 9 0 500
Interpretation:
Track No.
Geophysical Intrep 12 Litho Extend Contacts
GEOLOGY 2 Litho Extend Contacts
Show Set 3 Text 0 Litho Extend Contacts
Show Set 4 Text 0 Litho Extend Contacts
Show Set 5 Text 0 Litho Extend Contacts
Show Set 6 Text 0 Litho Extend Contacts
Show Set 7 Text 0 Litho Extend Contacts
Show Set 8 Text 0 Litho Extend Contacts
Depth:
Track No.
Show Depth Track 1

The Display List Menu.

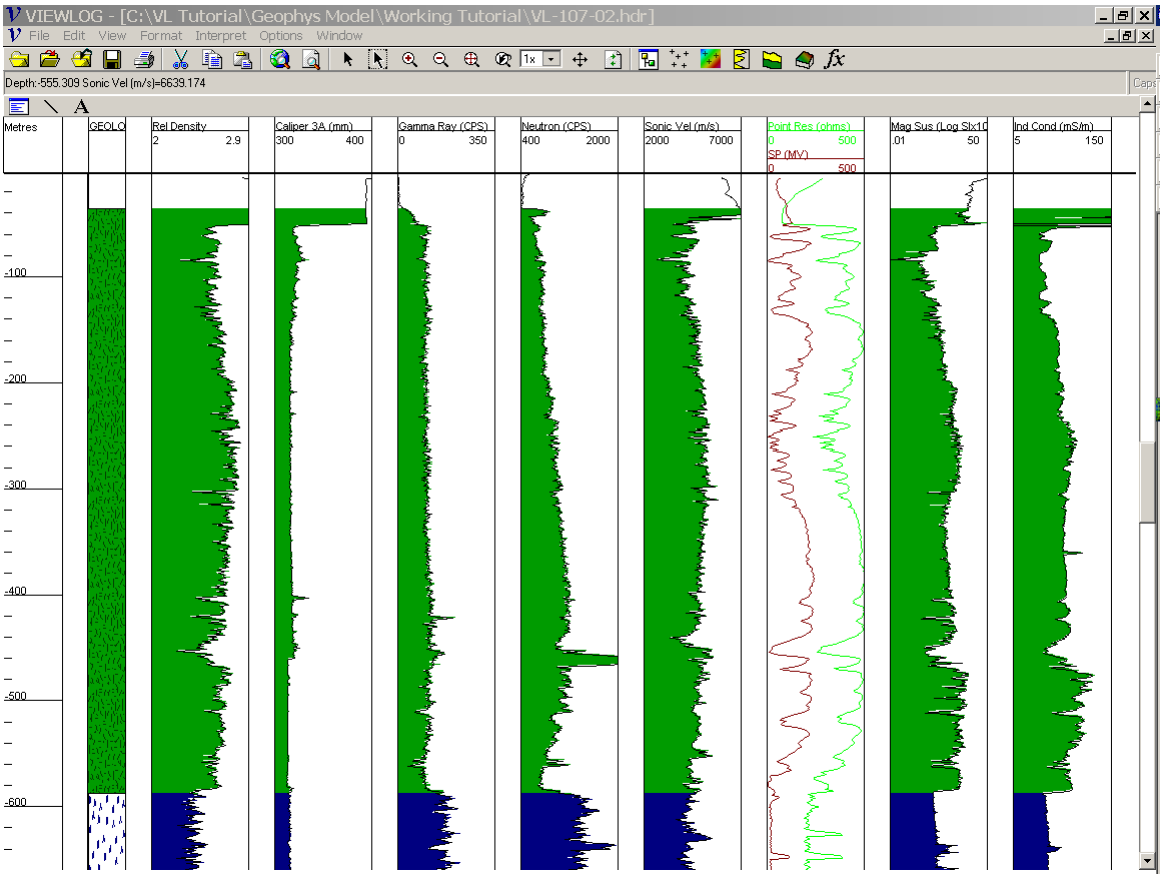
5. Put the cursor in any track and right click, choose attributes. On the **Display** tab in the log fills, check on **show**. Make the left boundary 1 and choose **Litho Colour** from the drop down menu for Colour and Geophysical interp from the drop down menu (located to the left of the Colour menu).
6. For Final Presentation/Printing, select **View/**Preview Mode.
7. To set the scale, select **Format/**Depth, and in the **Scale** tab, in the **Depth Scale Print and Preview Mode** section, set the scale to 1:4000.
8. Select **File/*Save as Template HDR*** and save the file as C:\VL Tutorial\Geophys Model\GeophysTemplate_11X17.hdr.

Checking Database Connectivity

TASK: Check Database Connectivity.

PROCEDURE:

1. Select **File/**Open Log Database. Under the **Open Database Well** tab, the table should now have records displayed.
2. Under the **HDR Template** box, C:\VL Tutorial\DATA\GeophysTemplate 11X17.hdr
3. Select (highlight) VL-107-02 in the table and click on **Open with Template** view a log within the database. See the figure below.



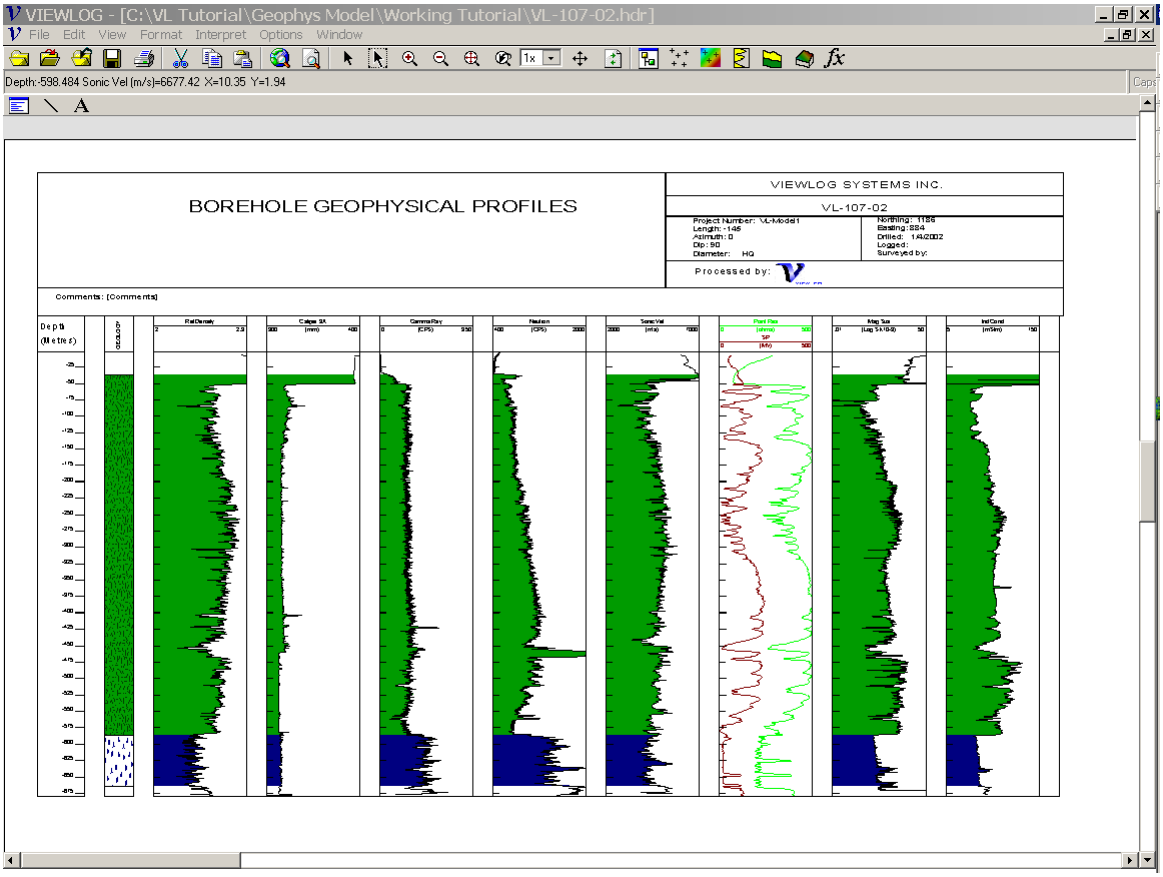
Connecting the Log Editor to the Database.

Printing a Geophysical Report

TASK: Prepare the Final Report figures.

PROCEDURE:

1. Choose **View/**Preview Mode, check that the depth scale is at the appropriate value, i.e. the complete log is on the page. Check that the scale for the individual log traces are at the appropriate values. Any editing can be done in preview mode as well as in edit mode.
2. The final figure should resemble the following figure.



Geophysical Report.

Creating a Header Template for Logs

Creating automated header templates for log reports is accomplished in the map editor. The header templates are then saved as a *.map file and "attached" to the log template (in the log editor) through the **Format/**Page/Global settings: Header Image tab. Selecting the header template in the file option and clicking the inline image button, will insure that the header template is always on top of the log tracks.

> **Note:** The Header Template has already been created for the student, this task is for explanation purposes only.

TASK: Create a linked Report Header.

PROCEDURE:

1. Open the Map Editor, under **File/**New Drawing.
2. Change to **Page View** by selecting **View/**Page View**,** and set the orientation of the page to match the orientation of the final Log report, from the **Format/**Page/Global settings (tabloid 11x17).
3. Using the drawing tools create a header box, large enough to display all the important information about the project and the well. This portion is highly dependant

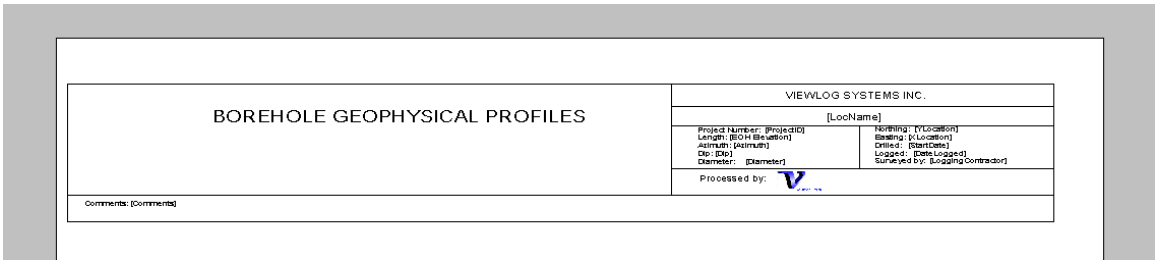
on the end user. Again please refer to the template headers included with this tutorial for some basic guidelines or refer to the figure below.

Linking the Header Template

TASK: Link the header template to the database.

PROCEDURE:

1. To link the header image (*.map file) to the database, choose **File/**Properties and the **Map File Properties** menu will open in VIEWLOG.
2. Choose C:\VL Tutorial\Geophys Model\Geophys Model.mdb for the file.
3. Choose Information for Template Header for the **Table Name**.
4. Choose LocName for **Match Field** and leave **Match Value** blank.
5. The field names from the database must be typed in with Square brackets see below. For example, select **Draw/**Text from the main menu and click to where you would like the text to be positioned. To display the total depth of the hole, type: Length: [EOH Elevation], where EOH Elevation is a field name from the query, Information for Template Header. The process can be repeated to incorporate all the information from the attached query.
6. When completed select **File/**Save as: C:\VL Tutorial\Geophys Model\MASTERHEADER_11X17.map



Template Header Image File.

7. To link the template header to a log file: (Only when the Log Editor is open and a log file is displayed).

   Open the **Format/**Page/Global Settings menu item.

   Make sure the **Width** and **Height** of the page are 11 and 17 inches, respectively

   Click the **Header Image** tab and select C:\VL Tutorial\Geophys Model\MASTERHEADER_11X17.map for the file.

   Make sure **In-line image** is checked.

   Close the window by clicking on **OK.**

Lesson 6: Geophysical Picking for Physical Rock Property Analysis

Geophysical picks are made, based on visual observations of how each parameter responds to a different lithology, i.e. For this tutorial, granite shows a high neutron, high gamma, low density response, whereas the porphyry model will have a low neutron, low gamma, higher density response in most cases. This is called preliminary picking, whereby the log analyst establishes the basic boundaries between two very distinct and unique litho units. Secondary and tertiary picking (for the completed tutorial; Rock_1a, Rock_1b, Ore_1, Ore_2 etc.), within the primary classifications, can be highly subjective and very dependent on the ability of the log analyst to accurately discriminate between slight changes in response per parameter AND the relationship of that response to the other parameters. The objective, via visual discrimination, is to establish UNIQUE lithoclasses as defined by all the parameters. This is usually done without the aid of the geological interpretation, thus making the geophysical interpretation unbiased.

Adding Contacts and Interpretation to the Database from Geophysical Logs

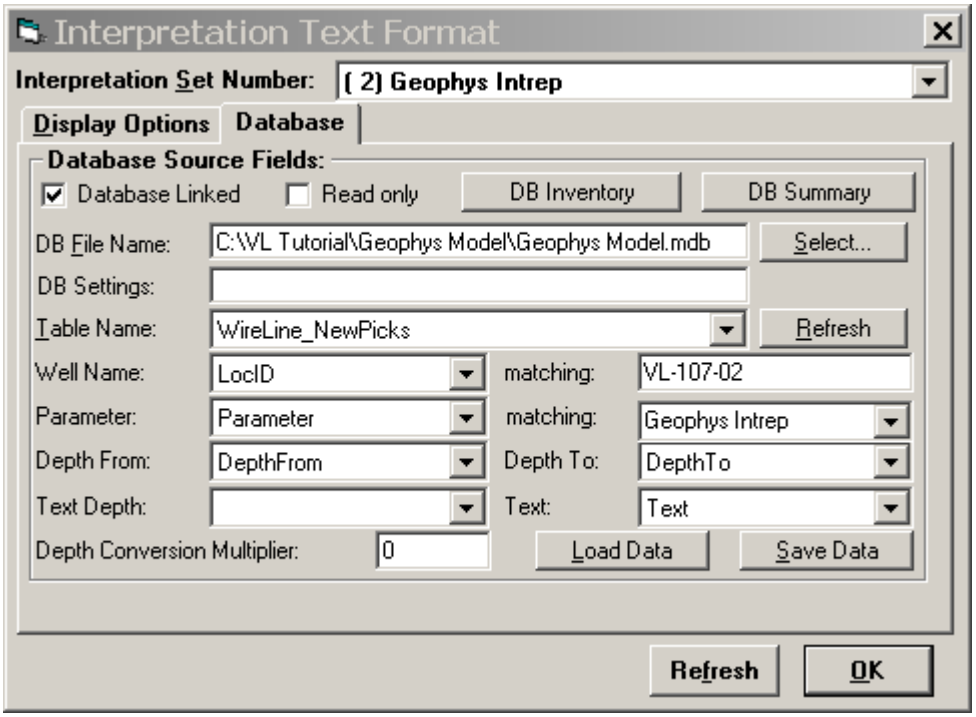
Often it is important to make interpretation picks from the geophysical logs. These picks can be directly saved back to the database.

TASK: Pick interpretation contacts from geophysical logs and save to the database.

PROCEDURE:

1. Create a new template for the geophysical picking. Choose the logs that are most important in determining the top/bottom contacts of the units of interest. For the purpose of this tutorial we will modify the existing geophysical report template.
2. Open Geophys Template 11X17 .hdr.
3. Choose **Edit/Create New/**Text/Litho/Photo Column.
4. Link the new interpretation column to the database. Right click in the new column, chose attributes and then select the **Database** tab. Fill in the **Interpretation Text Format** menu according to the diagram below. A new table was created in the database to incorporate your geophysical picks, “WireLine_NewPicks”. This table consists of LocName, LocID, Parameter, DepthFrom, DepthTo and Text. The parameter field will indicate that these interpretations have been made from Geophysical Interpretations (GI). Press **OK** when finished.

> **Note:** Make sure that the **Read only** box in NOT checked on.



Linking the interpretation track to the database.

5. Save the new template as Geophys Picking Template.HDR, **File/**Save as Template HDR. Now this template can be used at any time when contacts and interpretations need to be accomplished. The geophysical tracks can be changed easily to display any of the relevant information. Please review Lesson 3: Log Interpretation.
6. Choose **File/**Open Log Database and change the HDR Template to the name Geophys Picking Template.HDR that was created. Now you can choose logs with which to practice your picking skills.
7. Adding Contacts and Text Interpretation has been covered in Lesson 3: Log Interpretation.
8. When satisfied with finals contacts line positions and interpretations, right click with the mouse in the interpretation track, choose attributes and click the **Database** tab. Click **Save Data**, and the contacts and interpretations will be saved to the database.

Note: The Geophysical Picking has already been completed for this tutorial. Therefore it is unnecessary for the user to have to complete this exercise for every hole. The following lessons on Multiwell Analysis are based on the geophysical picks already completed. For the remainder of this tutorial the interpretive picks will be referred to as “lithoclasses”.

Lesson 7: Physical Properties and Multi-Well Cross Plotting

Cross-plots of two or more parameters, keyed to the geophysical lithoclasses, give a visual check on the original geophysical boundary picks. The definition of a lithoclass is a UNIQUE grouping of measurements, as defined by a set of given geophysical parameters. The degree to which the class is unique, is established via visual discrimination from field plots and cross-referenced by cross plots.

> **Note:** To complete this section the Multiwell Module for VIEWLOG is required.

On a cross plot, a lithoclass is represented by a cluster of points. The degree to which the points cluster in conjunction with the extent of separation between the individual clusters defines the "uniqueness" of each lithoclass. In VIEWLOG there are a number of ways of presenting the data; from 2D plots and 3D plots of individual holes to multiwell cross plotting in both dimensions. 2D cross plots from single holes allow the log analyst to visually verify the geophysical picks and make the corresponding adjustments. Multiwell cross plotting allows for the integrated solution, by plotting a series of holes together, testing the association, relationship and more importantly the degree of correlation of the lithoclasses across the body.

Cross plots also provide a visual cross-referencing methodology on the calibration and normalization procedures. Though many of the calibrations, for individual parameters are derived from predetermined processes, in many cases serious errors can result. Cross plots in combination with composite plots provide a method of quality assurance and quality control, before the logging has been completed.

> **Note:** For more information on physical rock property theory please refer to the Topic Reference guide in the Main VIEWLOG Help Menu.

Database Connection Settings for Multiwell Cross Plotting

> **Note:** For the purposes of this tutorial all the geophysical picking/interpretations have been completed for the student.

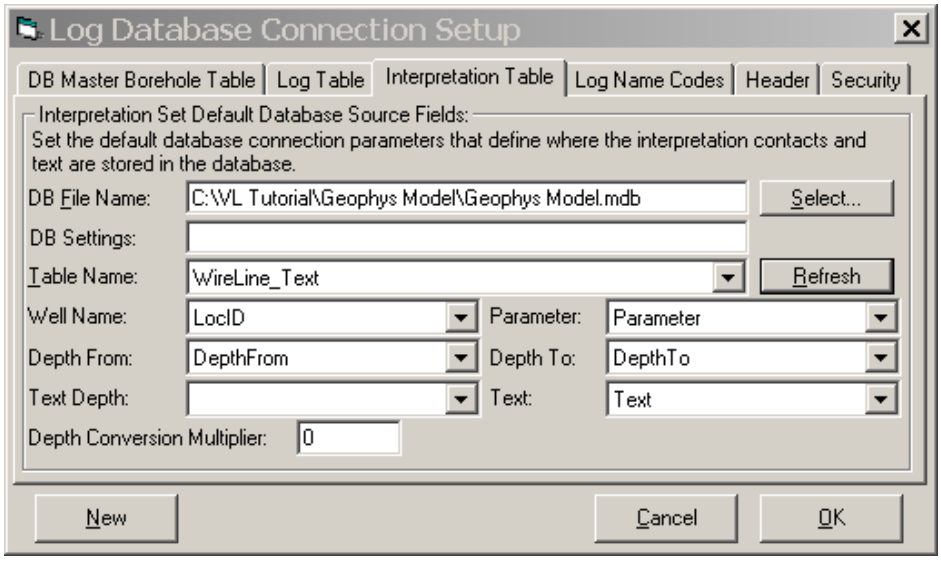
TASK: Create a new DB configuration for multiwell analysis.

> **Note:** Please refer to Lesson 5: Connecting to the Log Database for a complete description of connecting the Log Editor to the database.

PROCEDURE:

1. Click **File/**Open Log Database and choose the **Database** tab. The DB configuration will default to the Porphyry Model.db that was created in previous exercises.
2. Choose **Configure Default Database Connection Settings**. On the **DB Master Borehole Table** tab, choose Logs with Geophysics for the **Table Name**.
3. On the **Log Table** tab leave the settings as they appear (please refer to Lesson 5: Connecting to the Log Database if the settings are not visible).

4. On **Interpretation Table** tab, set the **Table Name** to WireLine_Text and click refresh. Set the remaining fields as shown below.



New Database Configuration Settings.

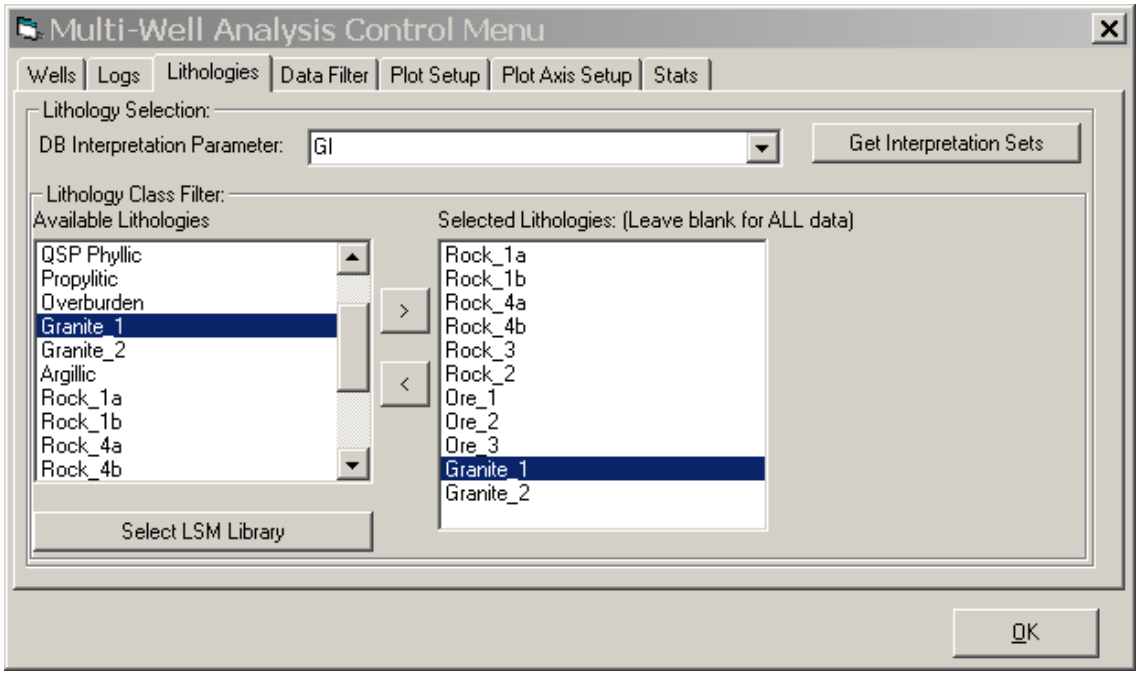
5. Choose **OK**.
6. Choose **Save DB Configuration** and save the new configuration as Porphyry Model with Geophysics.db
7. Choose **Close**.

2D Multiwell Cross-Plotting

TASK: Create a 2D Multiwell Cross Plot.

PROCEDURE:

1. Choose **File/**Multi-Well Log Analysis. The **Multi-Well Analysis Plot** window will be displayed.
2. Choose **Options** from the Main Menu bar.
3. Starting from the left on the **Wells** tab, highlight logs VL-107-02, VL-121-02, Vl-122-02 and VL-123-02 and select the > to transfer them over to the Selected Wells screen
4. On the **Logs** tab select **Get Available Logs** tab.
5. Highlight all the Logs and select the > to transfer them to the **Selected Logs** screen
6. On the **Lithologies** tab select the **Get Interpretation Sets** and click on the drop down arrow to obtain the GI interpretation set. Select the lithoclasses (already defined for the student) as shown below.

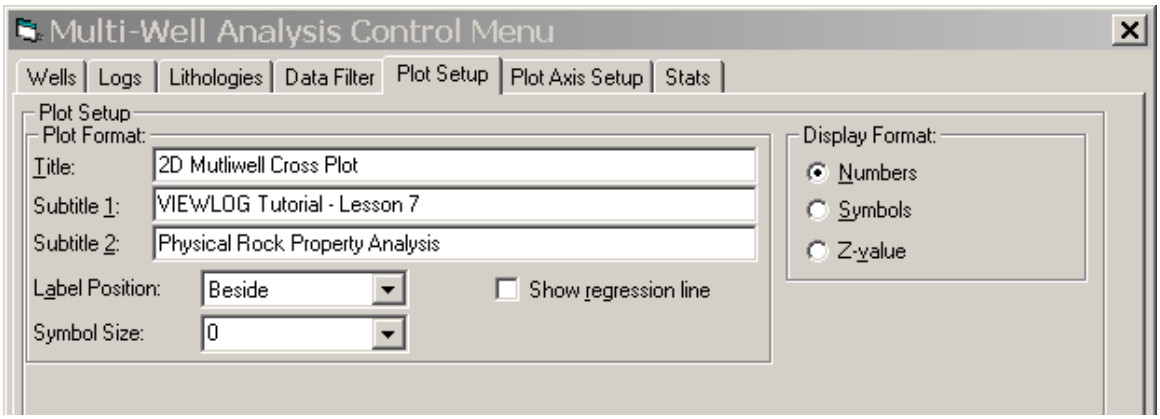


Multi-well Analysis Control Menu.

7. On the **Data Filter** tab, set the **Resample Depth Interval** to 0.2.

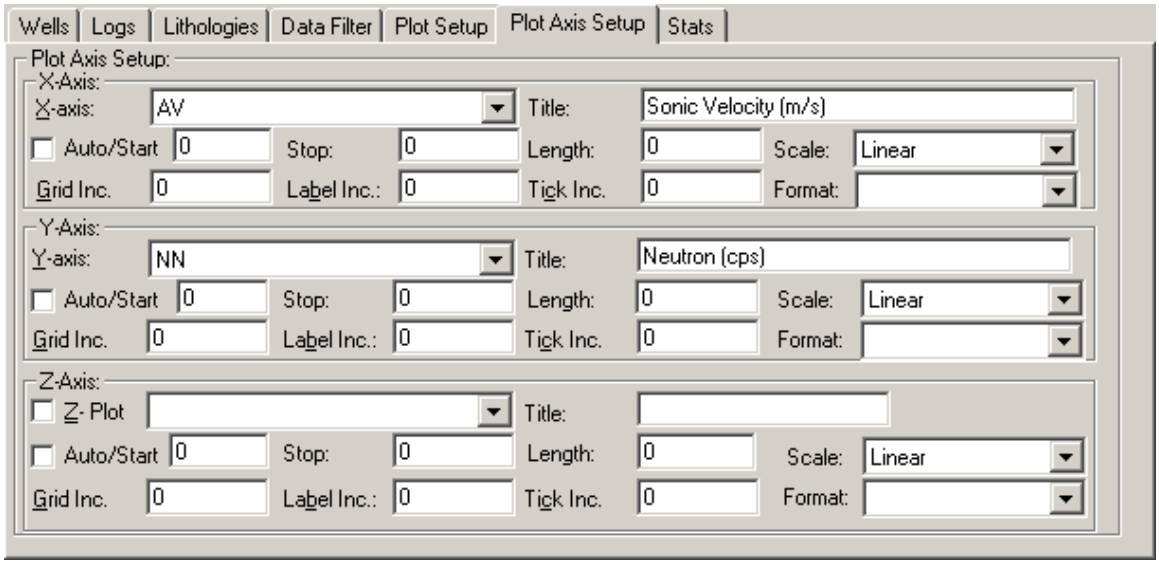
> **Note:** It is important to set a resample interval. Setting a resample interval will decrease the regeneration time of the cross plot. The regeneration time of a cross plot is highly dependant on the speed of the students computer.

8. The **Plot Setup** tab can be filled in as shown below or at the student's convenience.



Plot Setup.

9. On the **Plot Axis Setup** tab set on the window as shown below.



Plot Axis Setup.

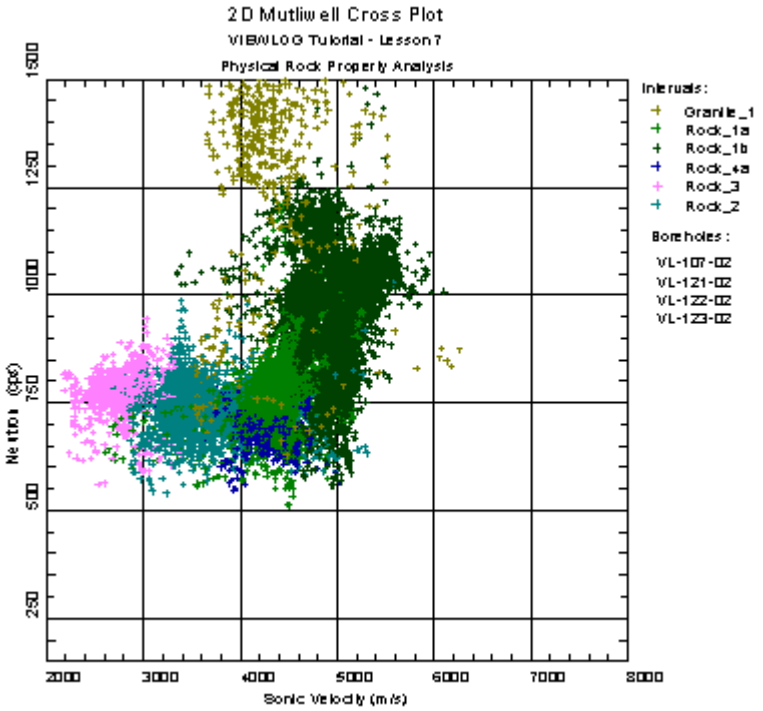
> **Note:** The start and stop scaling has been chosen to best represent the data, however by checking on the Auto/Start, VIEWLOG will automatically scale the axis.

10. Choose **OK.** to display the cross plot.

> **Note:** VIEWLOG will display on the status line the of loading the logs chosen for the cross plot analysis

11. To return to the **Multi-Well Analysis Control Menu**, choose **Options** from the Main Menu bar.

12. To save the cross plot choose **File/**Save As and save the plot as 2D Geophysical Cross Plot.xpt



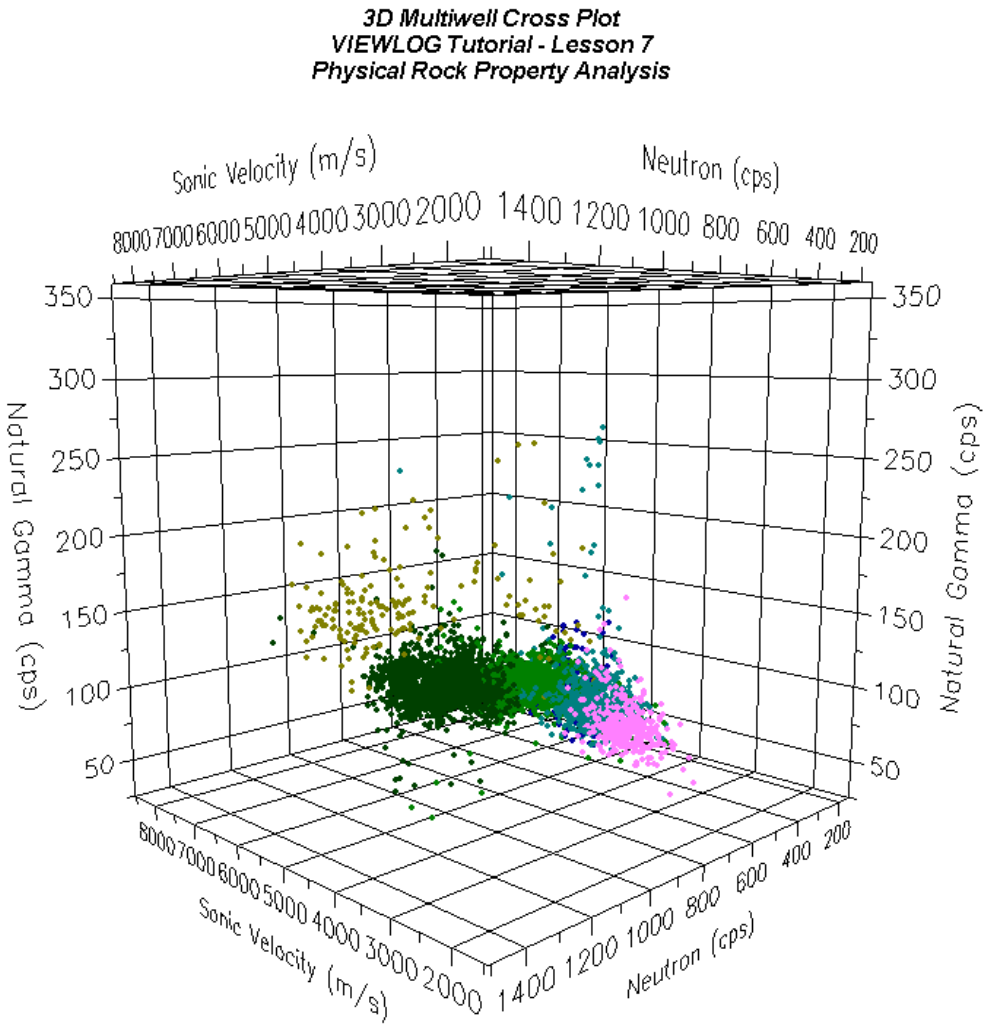
2D Cross Plot.

3D Multiwell Cross-Plotting

TASK: Create a 3D Cross Plot.

PROCEDURE: (continued from the previous task)

1. Choose Options to return to the Multi-Well Analysis Control Menu
2. Choose the **Data Filter** tab to be 0.2
3. Choose the **Plot Axis Setup** tab. The previous setting will have remained from the 2D cross plot.
4. Click on the **Z-Plot**
5. Choose NG for the **Z axis** and change the **Title** to Natural Gamma (cps)
6. Change the axis scale to **Start** at 25 and **Stop** at 350
7. Choose **Ok**
8. Choose **Regenerate** from the main menu bar.
9. Full on screen editing of the cross plot can be accessed by right clicking any where on the screen
10. To save the cross plot choose **File/**Save As and save the plot as 3D Geophysical Cross Plot.xpt.



3D Cross Plot.

Lesson 8: Auto Classification/Prediction of Physical Properties

One of the main features of any exploration program is the drilling of exploration holes and defining the geology of the recovered core. This is usually accomplished via diamond drilling and can quickly account for the majority of any exploration budget. The use of reverse circulation drilling (i.e. no core recovery) can be viable alternative as the drilling expense is significantly less.

> **Note:** To complete this section the Multiwell Module for VIEWLOG is required.

However; defining the downhole geology from recovered chips can be a less than exact science. By initiating a downhole geophysical logging program at the onset of drilling, lithoclasses can be established (geophysical picking) and used as a method for predicting the geology in the subsequent reverse circulation holes planed in the next exploration season..

> **Note:** For more information on Classification/Prediction theory please refer to the Topic Reference guide in the Main VIEWLOG Help Menu.

Physical Rock Property/Lithoclass Classification Library

TASK: Create the Classification Library.

> **Note:** If the student has closed out from the **Multi-Well Log Analysis** menu, chose **File/**Multi-Well Log Analysis to open the **Plot** menu. Then choose **File/** Open Plot Setup and open one of the previous cross plots generated in Lesson 7. Choose options, once the plot is open and make sure that the settings have remained the same. If not repeat Lesson 7: Physical Properties and Multi-Well Cross Plotting to generate a new cross plot.

PROCEDURE: (continued from previous lesson)

1. In the **Multi-Well Analysis Control** Menu, on the **Stats** tab, choose **Build Class Library**. Save the file as Litho Prediction.clb. Close the Multi-Well Menu.

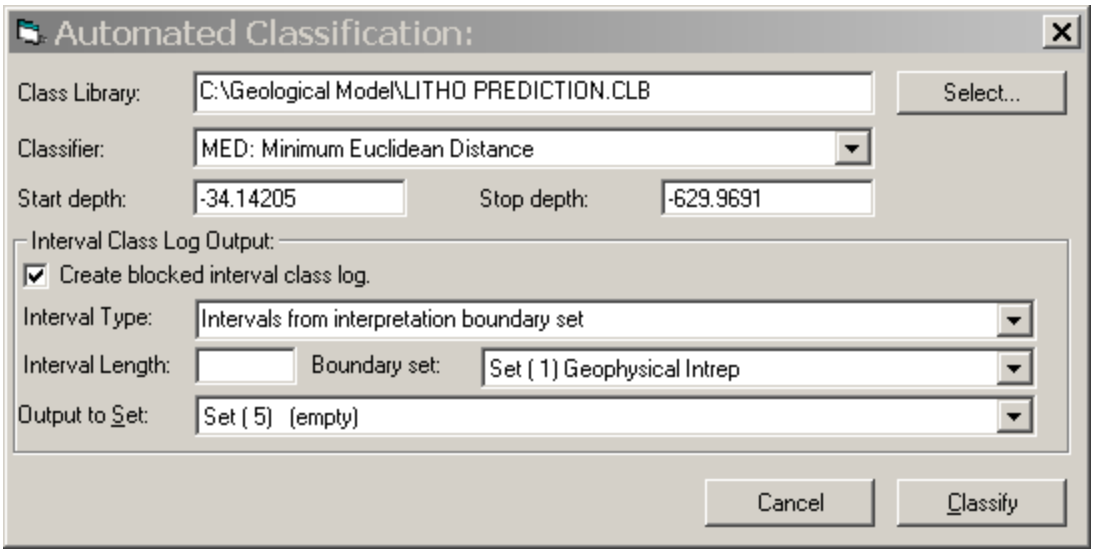
> **Note:** It is very import for this lesson that the setup of the Multi-Well Analysis Plot is identical to that in Lesson 7, because we are creating a lithoclass library based on Vl-107-02, Vl-121-02, VL-122-02 and Vl-123-02, which will be used to predict the new lithoclasses on the remaining holes in the geophysical database.

2. Choose **File/**Open Log Database.
3. Choose Vl-136-02 and click on **Open with Template**.

> **Note:** Make sure that the HDR Template is set to Geophysical Template.HDR (provided for the student)

4. Choose **Interpret/*Auto Classify***.

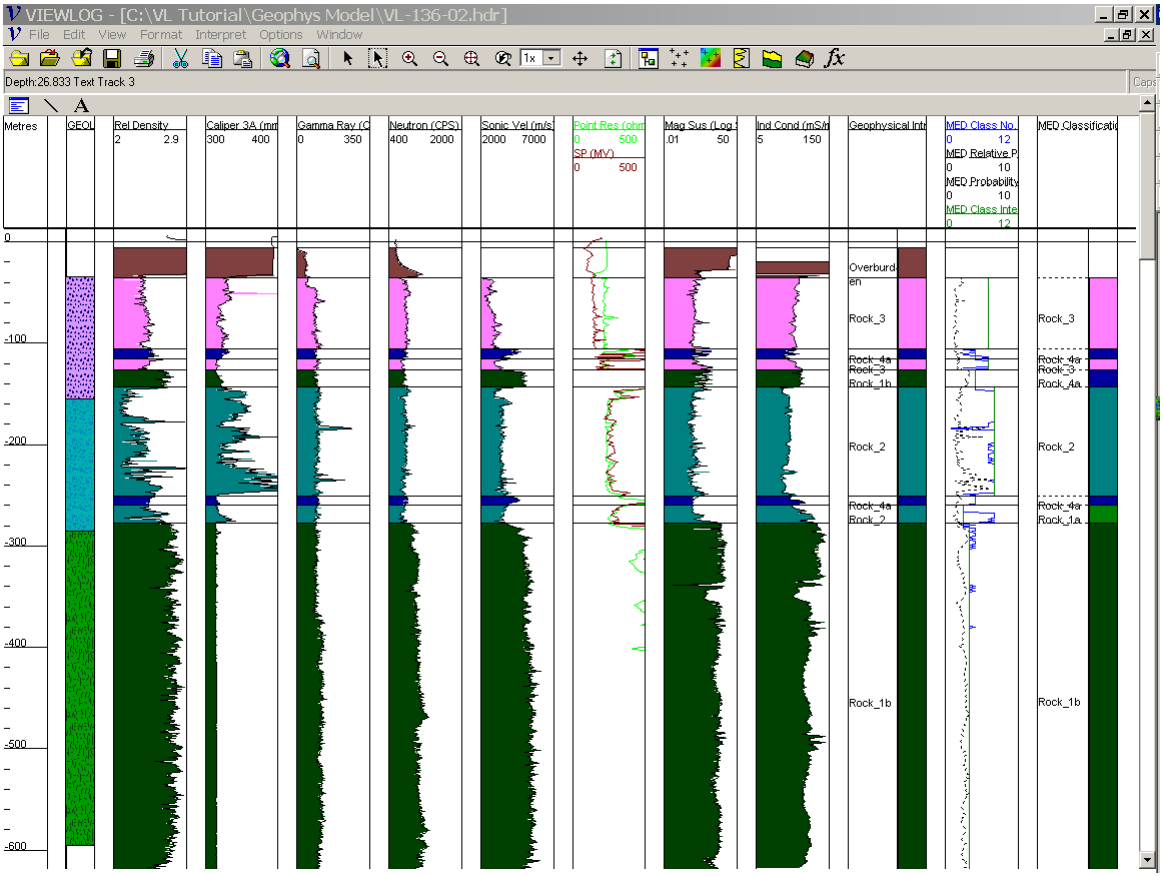
5. Press and drag the mouse to define the auto classification interval, starting at –34m to the bottom of the log.
6. The **Automated Classification** screen will appear. Complete the window as outlined below, choose classify.



Automated Classification Window.

Note: A complete description of the different log **Classifiers** and **Interval Class Log Output** functions is available in the VIEWLOG Topic Reference Guide in the main Help Menu.

7. On the VL-136-02 plot will now appear five new traces. The MED Class No. is the predicted class number as defined by the Litho Prediction.clb file. The following two traces are the calculated probabilities and the final trace is the class interval as defined by the Class Log Output. The trace on the far right hand side of the log plot is the final result of the prediction. See the figure below.



Automated Classification Results.

The accuracy of the classification and prediction depends primarily on the uniqueness of the downhole physical property responses of each lithoclass. If inconsistent or non-unique litho-classes are used, classification results will be poor. The use of too few physical property parameters can inhibit classification, by not providing enough discrimination between units. Conversely, the use of too many parameters may smear the classes and result in poor discrimination. Alternatively the use of a binary classification in conjunction with more than n+1 parameters, will results in excellent predictions.

Lesson 9: Getting Started with the Map Editor

Creating a New Drawing

TASK: Create a new VIEWLOG drawing file.

PROCEDURE:

1. From the Main VIEWLOG menu, select **File/**New Drawing to create a new drawing file.
2. By default, the new drawing has the dimensions of the currently defined printer page. Select **View/**Zoom Out (shortcut: **F5**) to see the whole page. The area outside of the printer page is gray, while the page area is white.
3. The dimensions of the page can be changed by selecting the **File/**Page Setup menu, and then changing the **Page Width** and **Page Height**.

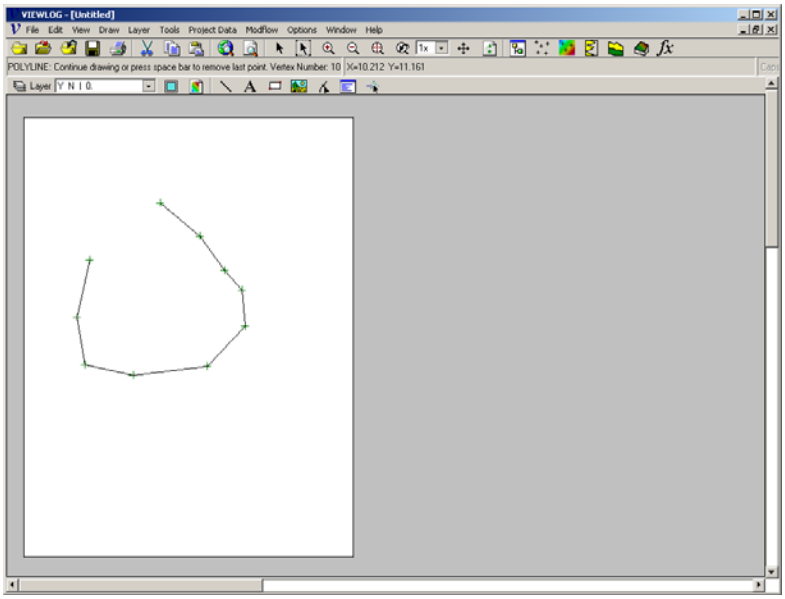
Drawing Polylines

TASK: Add a polyline.

PROCEDURE:

1. To draw a simple polyline, select the **Draw/**New Polyline menu item (or click on the icon).
2. Then repeatedly click and move the mouse to draw a line on the page. An example is shown below.

> **Note:** To create a closed polygon, the first and last point of the polylines can be connected by setting the "closed" attribute option. To edit the attributes of the polyline, first select the line and right click the mouse, and select **Data Attributes**. This window can also be used to edit the color and thickness of the line, and to fill the polygon with a solid color or pattern.



Drawing a new polyline.

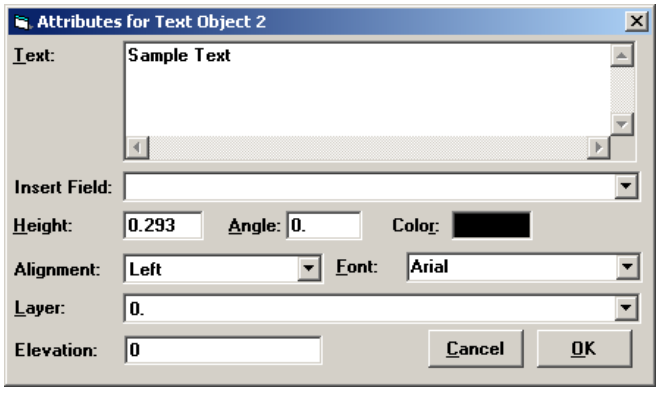
Note: When drawing new polylines, the attributes (line color, thickness etc.) of the previously drawn will be used by default.

Adding Text

TASK: Add Text.

PROCEDURE:

1. Add a text label to the page by selecting the **Draw/**Text Attributes menu item (or click on the A icon).
2. Click at the desired location of the text, and then enter the text in the window, as shown below.



Entering text in the Text Attributes window.

3. Click on **OK**.

> **Note:** To define the text angle interactively when adding text, select the **Draw/**Text menu item, and then click and drag the mouse to define the text orientation. The text angle will be set to the angle defined by the click and release point.

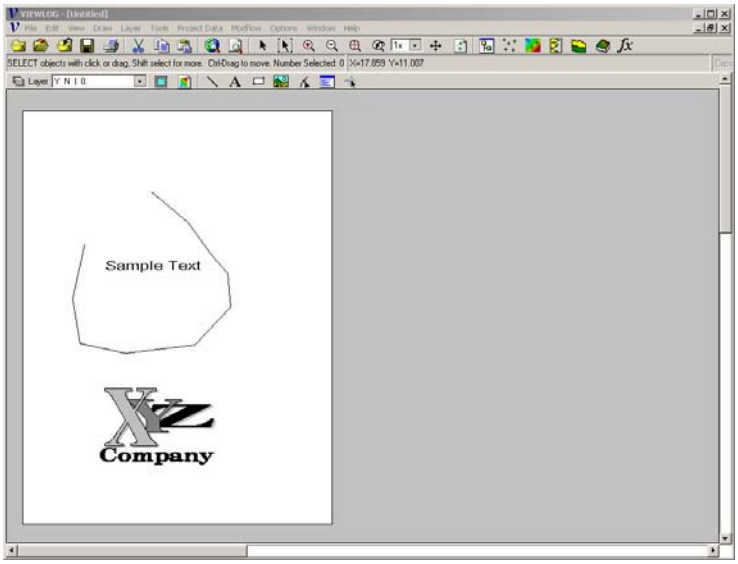
Linking Images

The ability to integrate image files greatly extends the capabilities of the Map Editor. Most popular formats are supported, including vector metafiles (WMF and EMF), bitmaps (BMP, JPG, GIF, TIF), and even other VIEWLOG files (MAP extension).

TASK: Insert a metafile.

PROCEDURE:

1. Select the **Draw/**Place Image menu item.
2. Click the left button and drag the mouse to define a box in which the metafile will appear.
3. On release of the mouse button the **File Open** window will appear. Select a WMF file (i.e., C:\VL Tutorial\Geophys Model\Company.WMF)
4. When the screen redraws, the metafile will be drawn within the box, as shown below.



Linking a WMF file.

> **Note:** To select an embedded image, click on one corner. Selected images can be stretched, shifted and transformed. The exact coordinates and attributes of the linked image can be edited using the **Edit/**Embedded Image Attributes command.

Importing a File into a Map

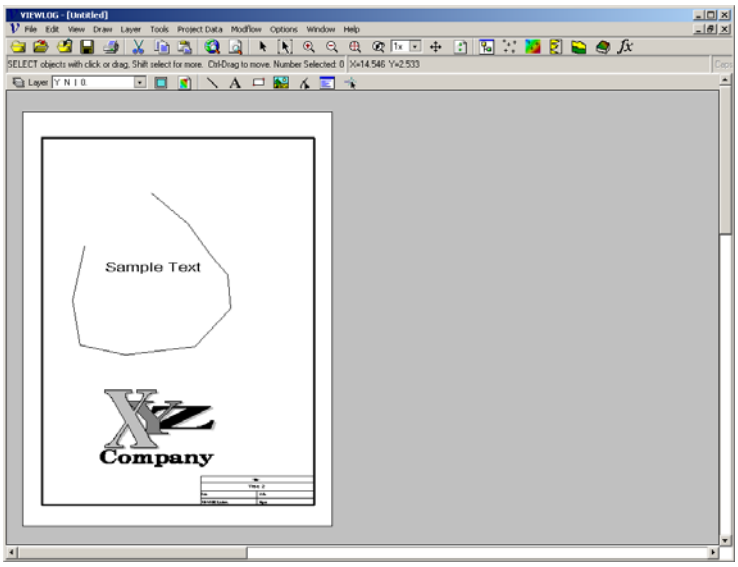
Other file types, such as SHP, DXF and existing VIEWLOG MAP files can also be imported. Importing a file is different than linking an image file. Importing allows the objects to be merged with existing objects, whereas linking only presents an "image" of the external map file.

TASK: Import an existing VIEWLOG map file.

PROCEDURE:

1. Select the **File/**Import/merge menu item, choose the appropriate file type, and select C:\ Program Files\VIEWLOG3\Borders\Border85.MAP
2. When the screen redraws, you should see that which is shown below.

> **Note:** On import, drawing layers and structure of the import file are preserved. Imported objects are all "selected" on import, allowing the attributes to be modified as necessary.



Importing an existing MAP file.

> **Note:** Imported GIS files are placed on World Coordinate Layers; DXF files can be placed on either Page or World layers.

Building a Geological Basemap

In the interest of time to the student a geological basemap has already been created for the student. The geology has been based on geological hand samples and field mapping (highly simplified). The Geology was created using the methods outlined above, using filled polygons to represent the geology and arranging those polygons in a significant manner. These polygons have been created on a new layer called Lithology fill. The student will explore layers in following lesson.

TASK: Open the basemap.

PROCEDURE:

1. Choose **File/Open/*Drawing File*** and select C:\VL tutorial\Geophys Model\Basemap.map

Setting the Page Size

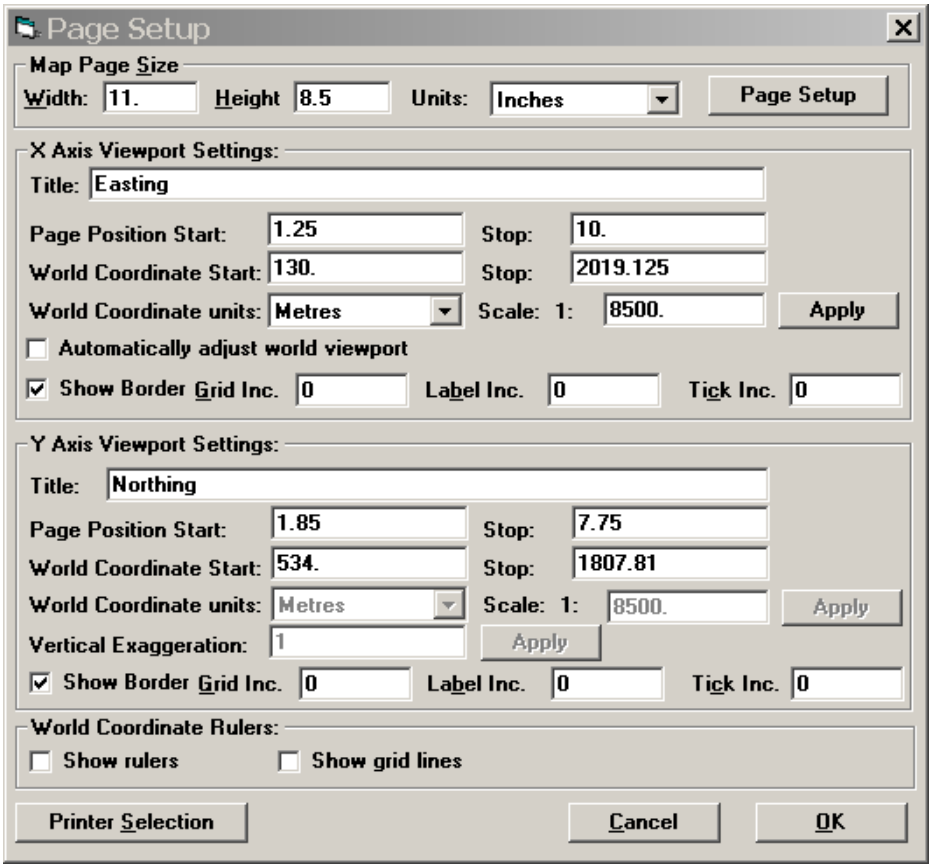
We will be creating a figure on an 8.5 x 11 inch sheet of paper, with a landscape orientation.

PROCEDURE:

1. Select **View/**Page View to switch to Page Coordinates.

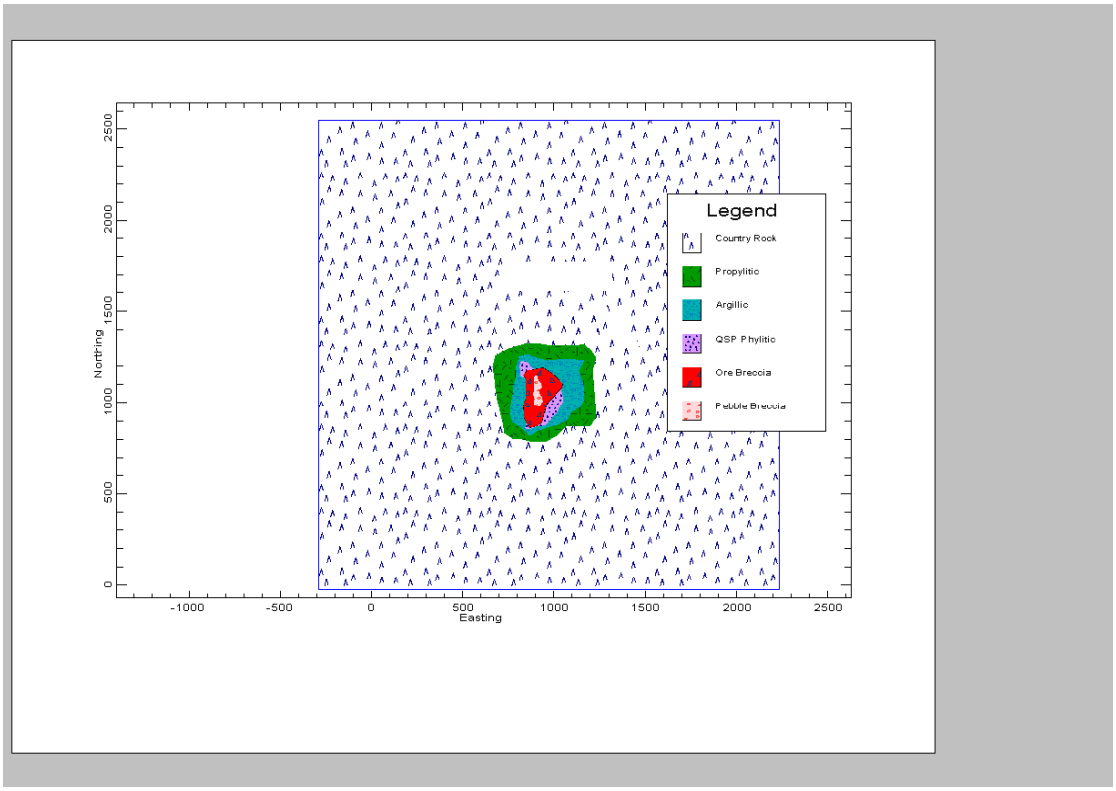
> **Note:** Page Coordinates can also be activated by clicking on the icon.

2. Select **View/**Map Scale Setup. You should see the following window appear as shown below:



The Page Setup Window.

3. In this window, set the Width to 11 inches and the Height to 8.5 inches.
4. Also, In the X**-Axis Viewport Settings**, you should change the **World Coordinate units** to meters.
5. Click on **OK**. You should see a diagram that resembles the figure below:



Geological Basemap.

Defining the Viewport

A viewport is used to display a portion of the World Coordinate system within a page. The page viewport can be thought of as a window on the world. Two parts of the viewport are defined: one in World and one in Page Coordinates. The world viewport defines the portion of the map or section that will be displayed. The Page viewport defines the position where the map or cross section will appear on the page. All objects in World Coordinates outside of the world viewport are hidden in Page View (the world viewport can be used to clip the map).

The viewports can be defined by either using **View/**Set Viewport or **View/**Auto Set Viewports.

TASK: Interactively define the Viewport.

PROCEDURE:

1. Make sure that the imported shape files from the previous task are in World Coordinates.

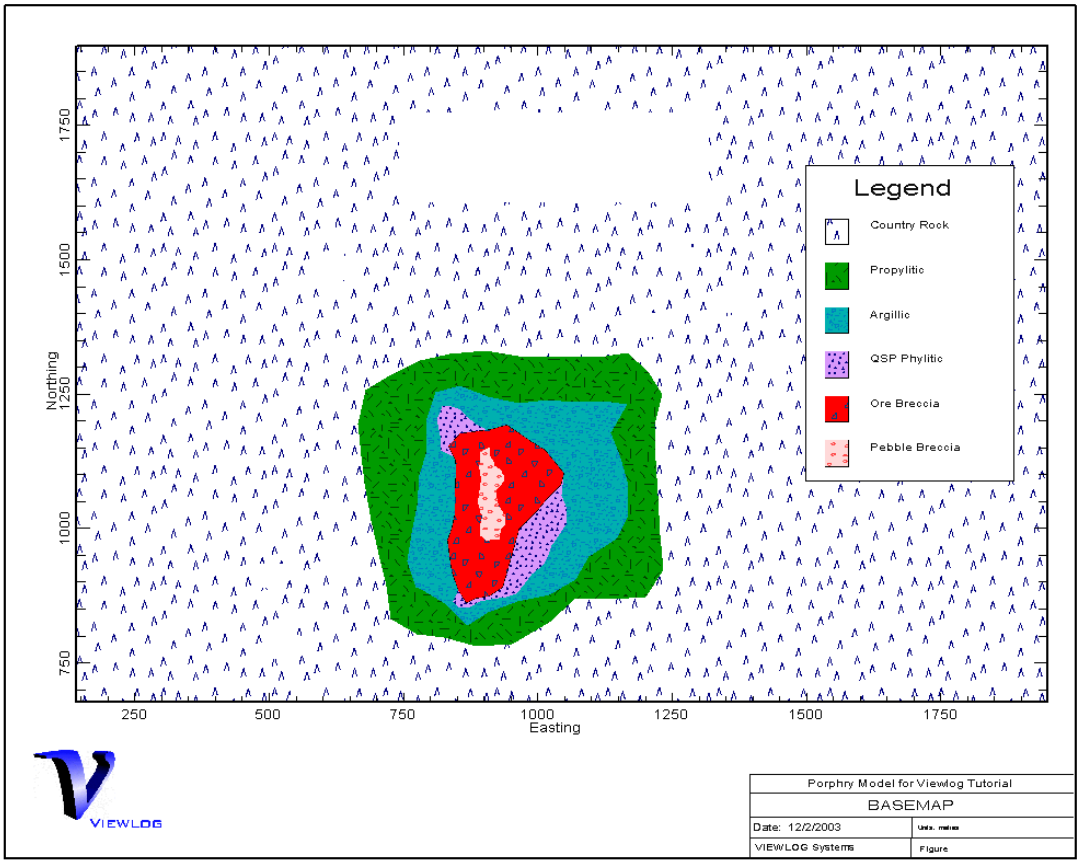
   Note: To check if a layer is in Page or World Coordinates, open the Layer menu by selecting Layer. Page layers are denoted by the icon, whereas World layers are denoted by the icon.

2. Select **View/**Set Viewport and click and drag to redefine the box around the entire drawing object, and make sure that all the objects are within the viewport box.

3. Select **View/**Page View to switch to Page Coordinates (i.e., place a check beside **View/**Page View or click on the icon).
4. Select **File/**Import/merge to import the border. Select the file C:\VL Tutorial\Geophys Model\VIEWLOG 85X11 border. map. Zoom out to view the entire page.

> **Note:** You can use either **F5** or the icon to zoom out.

5. Finally, define the Page Viewport. Return to World View, click the .
6. Select **View/**Set Viewport. Click and hold the left button on the map to adjust appropriately within the map border.
7. Return to Page View, click on the icon.
8. Select **File/**Save As and save the file as C:\VL Tutorial\Geophys Model \Basemap.map.



Page View map showing World-Coordinate objects.

> **Note:** The title box can be edited by zooming in on the bottom right-hand corner. Select the icon and drag the select box around the text you wish to edit.

9. At this time, it is a good idea to experiment with both the Page and World Viewports. Set new viewports in both Page and World Coordinates by selecting **View/**Set Viewport and drawing a new box to define the viewports. As you change the viewports, flip between Page and World Coordinates to examine the effects of changing the viewports. This will help you to learn about the VIEWLOG viewports in more detail.
10. To automatically define the viewport, begin by setting the page dimensions in the **View/**Auto Set Viewports commands. Then choose the Page and World Viewports appropriate for the specific map data.

> **Note:** The exact position and dimensions of the page and world viewports can be set in the **View/**Map Scale Setup window. To set the position of the Page viewport, edit the **Page Position Start** and **Stop** values for the X and Y-axis. To define the exact map scale, in the **World Coordinate units,** enter the **Map Scale** (e.g., 8,500) and click on **Apply**. This will reset the World Coordinate Stop value to a value appropriate for the selected map scale.

Creating a Map View

TASK: Create a Map View

PROCEDURE:

1. Make sure you are in Page View by placing a check beside **View/**Page View (or by clicking on the icon).
2. Select **View/**Map View Menu. A Map Views window will appear.
3. In this Map Views window, add a new map view by selecting the icon.
4. Call this map view Figure 1: Basemap.
5. Close the Map Views window.

Completed with Map Views

TASK: Create additional Map Views.

PROCEDURE:

1. To examine the Map View functions more closely, create a second Map View.
2. Change the Viewport in both Page and World coordinates. To do this, use **View/**Set Viewport in both World and Page coordinates.
3. Create a viewports that are distinctly different from that in the previous section. Once you have done this, click on the icon in the Map Views window, and enter a new name for the new Map View.

4. You will now be able to flip back and forth between the two Map Views you've created by simply double-clicking on each Map View on the list. As mentioned above, Map Views also store which layers, Data Sources and Data Parameters are active.

> **Note:** You might find it easier to define the viewport in Page View first. This allows you to control the size and shape of your map on your page. Once you are satisfied with this, flip to World coordinates and set the viewport. You will find that the shape of your viewport in World coordinates is restricted by the aspect ratio of the viewport you have set in Page coordinates. You can resize the viewport, but you will not be able to change the aspect ratio (i.e., the ratio of the width to the height of the viewport box), because the viewport you are specifying in World coordinates must fit in the window you have already set in Page coordinates.

Map Text Fields and Automatic Titles and Legends

VIEWLOG map text objects can contain keywords that invoke powerful internal variables and advanced display properties. These include, for example, a keyword that automatically generates a map legend that dynamically adjusts depending on what map features are visible.

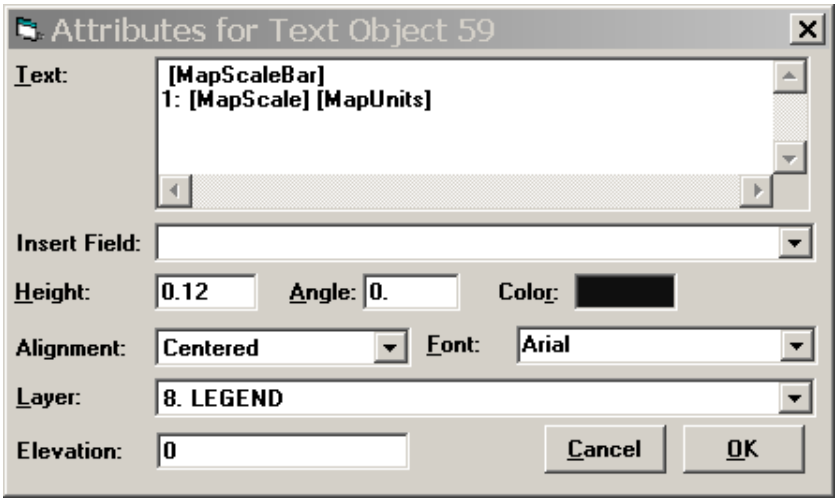
Map Text Fields are keywords, enclosed in square brackets and inserted in a text object. VIEWLOG has a number of text fields built into the Text Attributes window (to access this window, use **Edit/**Text Attributes once you have selected an existing Text object, or, with new text, use the **Draw/**Text, and click the left mouse button in the area you want text to appear – this will open the Text Attributes window for the new text).

TASK: Insert a Map Text Field.

PROCEDURE:

1. Make sure you are in Page View (i.e., ensure that **View/**Page View is checked).
2. Select the **Draw/**Text command, and click to define the text location. The Map Text Attributes window will be displayed.
3. Click on the **Insert Field** list box, and choose the [MapScale] item. This will insert the selected scale into the text box.
4. To add the map scale, repeat the above, except type into the text box the word "1:" and insert field [MapScale],
5. Adjust the text height and other options as necessary. Select the objects using the select tool from the icon menu bar, then right click, select **Display Properties.**
6. Click **OK** to exit the menu.

> **Note:** You can combine regular text with the **Insert Field**.



Automatic Map Scales.

7. Chose file save as C:\VL Tutorial\Geophys Model\Basemap.map

Lesson 10: Working with VIEWLOG Projects

VIEWLOG is designed so that only one copy of each field measurement is stored in the database. Centralized storage offers numerous benefits, including improved error tracking, reduced data volume, and simplified data backup.

While the database provides centralized field data storage, a corresponding system was required to manage the information on multiple maps and cross-sections that make up the interpretation of the data. VIEWLOG Project files provide the key linkage between the database, the geologic interpretation, and the numerous maps and cross-sections. Most important, Project File objects link the following:

- Raw data stored in the database
- Display appearance for plan, section and 3-D views
- Interpretation and interpolation results, and
- Processing and analysis functions.

Setting up a Project

Creating a Project file will allow links with the database and common elements of the geologic model to be stored. Objects in the Project file can be viewed in multiple maps and cross sections at the same time. While multiple maps can be open at the same time, only one project can be open in VIEWLOG at one time.

At this point in the Tutorial, we have successfully created a basemap and map views. The next step is to create a project.

TASK: Create a VIEWLOG Project.

PROCEDURE:

1. Make sure that the C:\VL Tutorial\Geophys Model\Basemap.map that you created in the previous tutorial is still open and that you are in Page View.
2. Select **File/Project…/**New Project, and save the new project as C:\VL Tutorial\Geophys Model\Geophys Model.prj. Click **OK** to create the project file.
3. Select **File/Project…/**Project Properties **.**
4. In the Litho Library Window select C:\VL Tutorial\Mining Symbols.lsm and click **OK**.

> **Note:** The Lithology Library is used to customize the symbols that are used to display lithology in borehole logs and in cross section. See Lithology Symbol Editor.

5. Select **File/Project…/**Link MAP to Project and click **OK**.

Registering the Base Map

It is important to remember to register your base map(s) and Cross Sections (in subsequent tutorials) in the Project Manager.

TASK: Register the base map.

PROCEDURE:

1. Make sure that the C:\VL Tutorial\Geophys Model\Basemap.map that you created in the previous tutorial is still open.
2. Select **Project Data/**Project Manager**.**
3. Select the icon and select Define Project Base map.
4. Select C:\VL Tutorial\Geophys Model\Basemap.map and click **Open**.

> **Note:** A Project file can be linked to multiple map and cross section files. Updating a Project file object will automatically update all linked maps and cross sections.

Lesson 11: Working with Data Sources

In this lesson, we will step through the process of creating Data Sources.

> **Note:** It is very important that you have completed the previous tutorials because the following tutorials are based on the basemap and project links that you have already completed.

Data Sources contain information about a group or class of boreholes or monitoring intervals and provide a logical structure for organizing, displaying and processing these data. Groups can be defined on any basis and use a database table or query for selection. Data Sources bring together the database link, display options, geologic display and editing and some grid-based processing functions.

While Data Sources are frequently used to define a group of boreholes that fall in one geologic formation, they are generally not used to classify measurements made in that formation. Data Parameters, which are outlined in Lesson 11, are used for that option.

The Data Source structure is very flexible, and because it contains a link to a database, as new boreholes are added to the database, they will automatically be added to the Data Source if they meet the conditions defined in the Data Source table or query.

Data Sources are used for:

- Borehole Location Management and Posting
- Grouping of Monitoring Information
- Linkage to HDR file for Geologic Information
- Database Linkage for on-section geologic unit picking
- Writing gridded (interpolated) information back to fields in the database

Creating a New Data Source

Creating a new Data Source and linking it to the database is a basic and common task in VIEWLOG

TASK: Create a Data Source.

PROCEDURE:

1. Open the C:\VL Tutorial\Geophys Model\Basemap.map in World view.

> **Note:** Remember that upon opening a map file the first time VIEWLOG will automatically open the map in Page coordinates (i.e., make sure the **View/**Page View is not checked).

2. Select **Layer** to open the Layer menu. Use the icon to create a new layer.
3. Name this layer “Boreholes” by clicking on the new, blank layer (the selected layer will be dark blue when highlighted).
4. Make the Boreholes layer the current layer by highlighting it and clicking on the icon.
5. Your new Boreholes layer may be at the top of the list. To move it down, highlight the layer and hit the icon to move the Borehole layer down to Layer number 3.
6. Make sure that this new Boreholes layer is in World coordinates. To do this, check the left-most icon. If the icon is shown, double click this icon to change this layer to World Coordinates. The icon will be changed to: .
7. Set the boreholes layer to be the default Source layer, by right clicking the mouse on the layer name and selecting “default Source layer”.
8. Close the Layer menu.
9. Select **Project Data/**Data Source (Shortcut: **F11**) to open the Data Source window; click **Yes** to create a new Data Source.

> **Note:** The Data Source window can be opened several ways. With the keyboard, you can use either **Project Data/**Data Source or **F11**. With the mouse, you can click on the icon, or right-click and select Data Source.

Showing and Freezing Layers

This lesson outlines how to change a Layer from visible to invisible and frozen to unfrozen.

TASK: Examine some features of the Layer menu

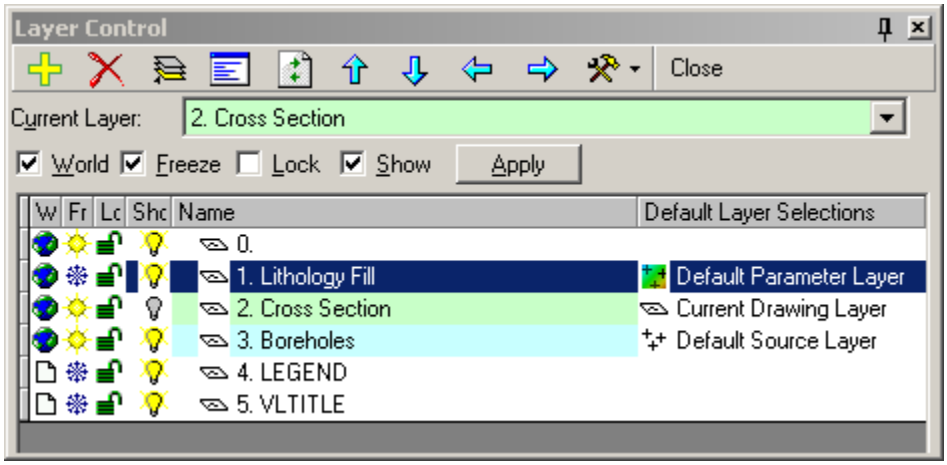
PROCEDURE:

1. Open the Layer menu by selecting Layer from the main menu.

Note: The Layer menu can also be activated by clicking on the Layer icon.

2. Freeze the Lithology Fill, Legend and VLTITLE layers by clicking the icon. Once a layer is frozen, you will see the icon.
3. Layers can be switched between invisible and visible mode by double clicking the and icons, respectively (see below). Make the Cross Section Layer visible. These are the predefined cross sections, associated with the following lessons and completed tutorial.

Note: Each layer is also defined as either a Page or World layer. Map objects, such as boreholes, should be on World layers; Figure objects, such as scales, legends and borders, should be on Page layers. Double-clicking the , and icons will switch between the two layer types.



The Layer menu for freezing layers.

Data Source: The List Tab

In the Data Source menu, there are nine tabs associated. You will discover that by following one tab after another, from left to right, each time you create a new Data Source, you will remember to fill in the appropriate information.

1. The **List** tab presents a list of all the Data Sources available in the current project (see Data Source: List Tab). The check box beside the name indicates whether the source is "activated" within the current map. Currently, there should be no Data Sources listed. To activate the new Data Source, check the box beside the name, and then select a layer on which the source will be displayed in the current map.
2. From the **Activated on Layer** drop-down menu, select the layer we just created: Boreholes.

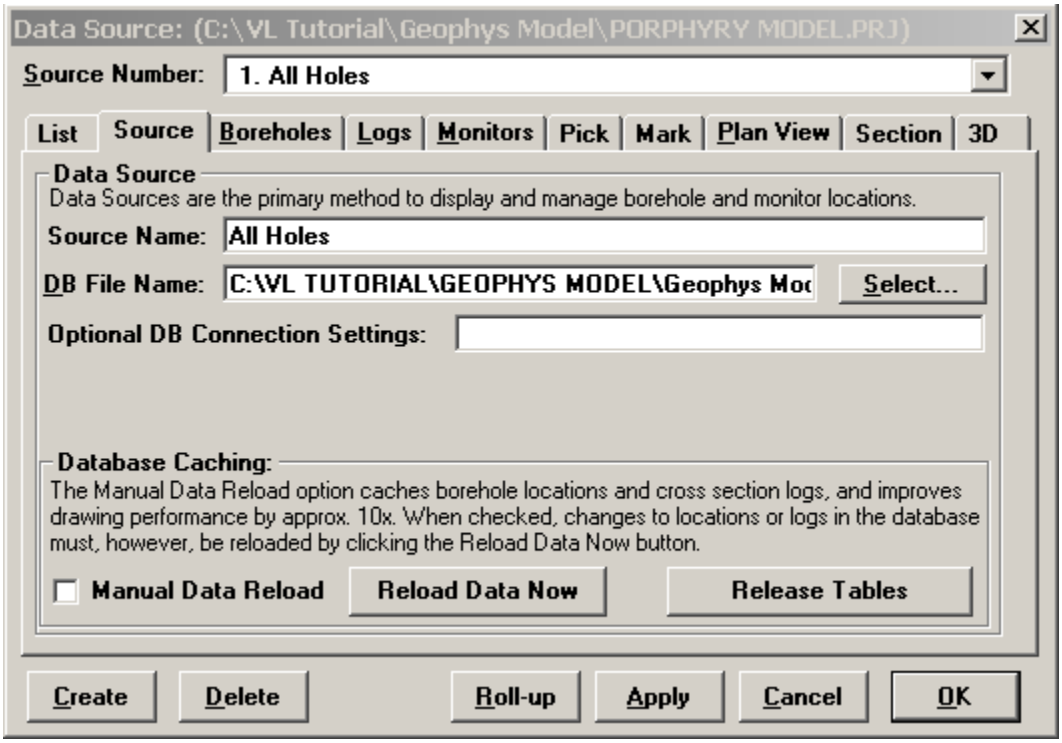
Note: It is important to note that for a Data Source to be visible it must be activated, the layer on which it is activated must be visible, and the display options (plan view, section view tabs in the Data Source window) must be set appropriately.

Data Source: The Source Tab

The **Source** tab defines the name of the Data Source and the basic database connection parameters (for more details, see Data Source: Source Tab).

PROCEDURE:

1. In the **Source Name** field, type All Holes
2. **To connect to an MS-Access file, click the Select**… button and choose the MDB file C:\VL Tutorial\Geophys Model\Geophys Model.mdb.



The Source Tab in the Data Source Window.

Data Source: The Boreholes Tab

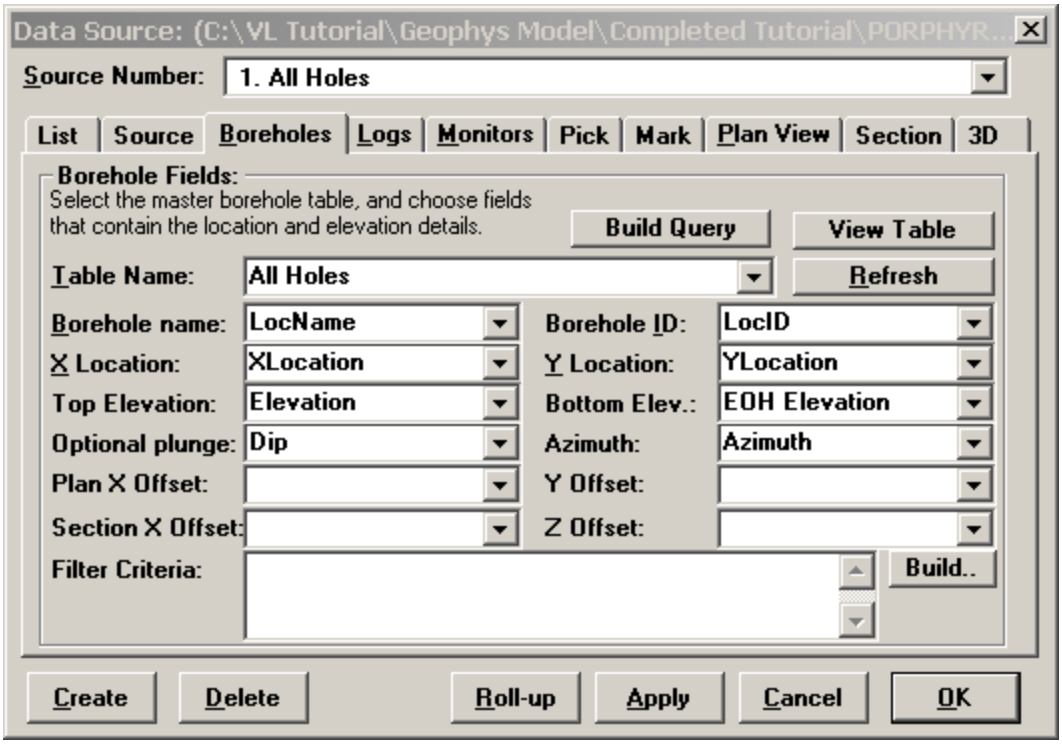
The database table and fields are selected in the **Boreholes** tab (see Data Source: Boreholes Tab). To view borehole locations in plan view, the name, ID, and location fields should all be linked to database fields. For viewing boreholes in cross section, the elevation field must also be linked. All other fields are optional.

TASK: Set up the Data Source fields.

PROCEDURE:

1. For the **Table Name**, select the query called All Holes from the drop down menu. Click Refresh to link the menu to the table. This query has been set up such that the fields should be loaded automatically. Compare your VIEWLOG window with that shown below.

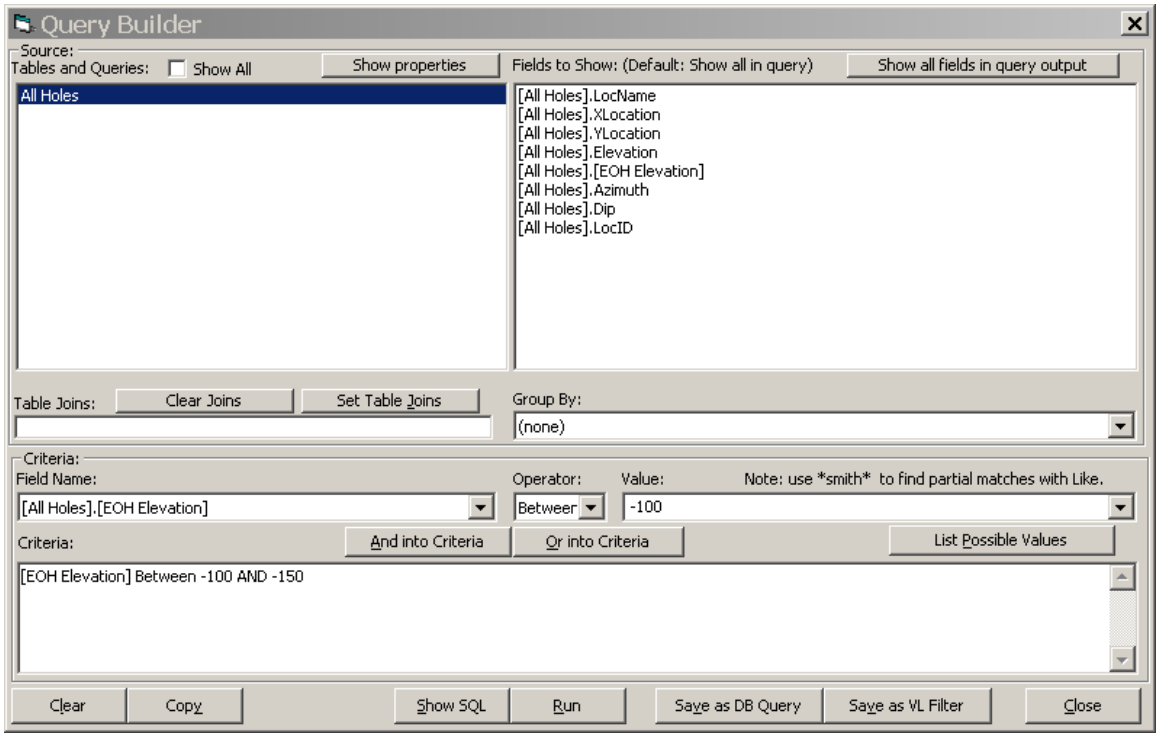
Note: Plunge and **Azimuth** are used to define deviated boreholes. The offsets can be used to generate custom label offsets, for display purposes.



The Boreholes tab in the Data Source window.

Note: The following exercise is used to demonstrate the usefulness of having filtering capabilities within VIEWLOG. IT is necessary after completing this task to remove the filter.

2. We will use the **Filter Criteria** box to show wells that are between than –100 and -150 meters (above sea level) and above 519 meters (above sea level). Click on the **Build..** button. This will open VIEWLOG's **Query Builder**, as shown below.



The Query Builder.

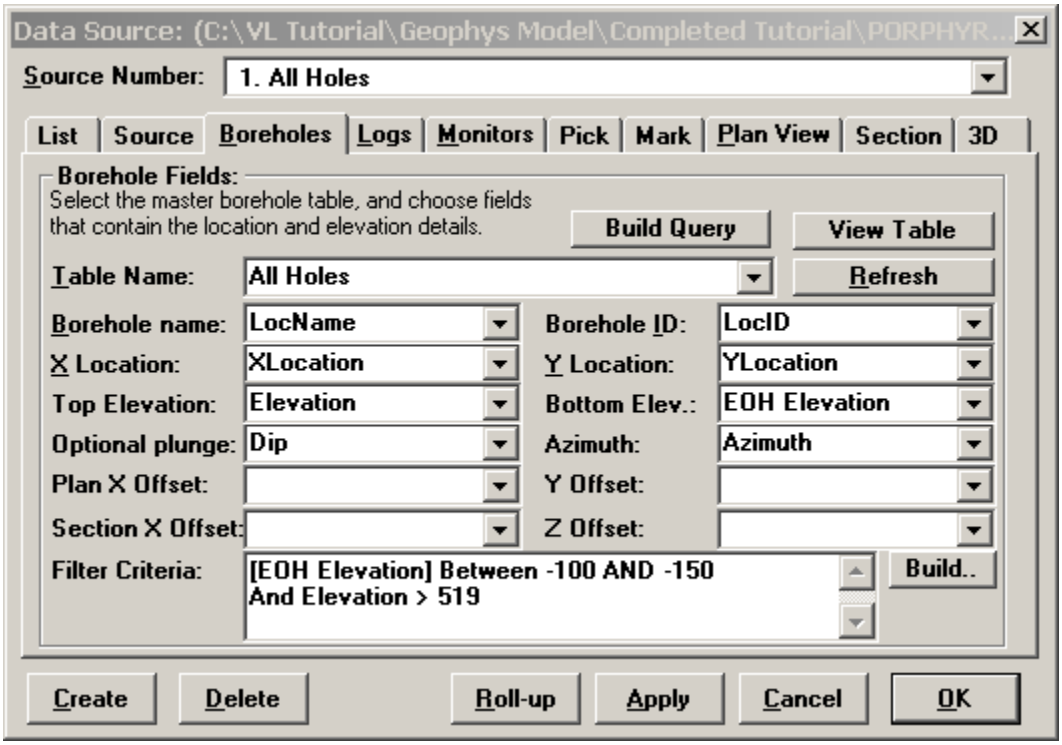
3. The upper right of the window lists all of the fields from the table you have chosen. For our purposes, we want to write a query that will exclude wells with a bottom elevation below 25 meters. From the **Field Name**, select [All Holes].[EOH Elevation] from the pull-down menu and choose '>' as the **Operator**. In the **Value** box, type in –100 and –150 (type the word and). Click on the **And into Criteria** button.
4. Repeat the process for wells with a ground surface elevation > 519 meters:

   Field Name: [All Holes].[Elevation]

   Operator: >

   Value: 519

   Click the **And into Criteria** button.
5. Click on the **Save as VL Filter button.**
6. Click on the **Close** button. In the **Borehole** tab within the Data Source window, you should see the **Filter Criteria** appear.



Filter Criteria on the Data Source Tab.

Data Source: The Logs Tab - The Default Template HDR file

The HDR file field is used to link a VIEWLOG HDR file to the borehole, and a default HDR file can be defined for all wells in this source. The **Logs** tab allows the user to specify two different HDR files (see Data Source: Logs Tab). The first – the **Default Template HDR** – is used to present borehole logs on cross section, in this case for the core geology. The second – the **Alternate Template HDR** – is used to show borehole logs in preview mode, in this case we will use our downhole geophysics and geophysical lithoclasses.. If the second HDR file is left blank, logs will be shown in preview mode using the default Template HDR.

> **Note:** In Lesson 5: Connecting to the Log Database, the student has created a Geophysical Template to display the downhole information. The next task is very similar to lesson file although all we will be doing is creating a single trace to display geological interpretation made from core samples

TASK: Create a Default Template HDR file for core geology.

PROCEDURE:

1. In the **Logs** tab, click on the **New** button for the **Default Template HDR File**. This will open the VIEWLOG Log Editor. You will see a blank borehole log that shows a depth track along the left-hand side.
2. Select **Edit/Create New…/**Text/Litho/Photo Column to create a new column of data.
3. Turn off the depth track by selecting **Format/**Display List. Uncheck the **Show Depth Track** checkbox, and click **OK**.

4. Move the mouse pointer over this new column, right-click and select **Attributes**.
5. In the window that appears, enter a new name: Core Geology
6. Turn off the text column by unchecking the **Show Text** check box.
7. Near the bottom of the window, change the **Default width** of the litho column to 0.2
8. Click on the **Database** tab to link the HDR file to the database.
   a. Check the **Database Linked** check box.
   b. Click on the **Select…** button and enter C:\VL Tutorial\Geophys Model\Geophys Model.mdb
   c. In the **Table Name** box, click on "Geology for Logs", and hit **Refresh**.
   d. Select LOCName for the **Well Name**, matching VL-124-02
   e. Set the **Depth From** to DepthFrom, and the **Depth To** to DepthTo.
   f. Set the **Text** to GeoName.
   g. Click on **Load Data**, and then hit **Refresh**.
9. Click on **OK** to close the window.
10. Select **Options/*Lithology Symbols…*** to specify a new lithology symbol library (see Lithology Symbol Editor).
11. In the upper left-hand corner of the **Lithology Symbol Library** window, click on **File**, and select **Open Library**. You will be asked if you want to save your current library; select **No**.
12. Select the library C:\VL Tutorial\Mining Symbols.lsm, and hit **OK** to close the Lithology Symbol Library. Your log should resemble that shown below

Note: Your lithology column may not be as wide as shown in the following figure.

Default Template HDR file.

13. To save this log as a template HDR file, select **File/**Save as Template HDR. Save the file as C:\VL Tutorial\GeoModelTutorial\Core SectionTemplate.HDR

14. Close the Log Editor by selecting the **File/**Close menu item. If you saved the HDR template in step 12 above, you can select No when prompted.

15. In the Data Source window, click on the **Select** button in the **Default HDR** section. Select the HDR file we just created: C:\VL Tutorial\GeoModelTutorial\Core Section Template.HDR

16. A second template has already been created for the student called Geophysics template for sections.hdr. The two of these templates can be used interchangeably. But for the current geological model will be using the Core Section Template.

Note: In the **Logs** tab of the Data Source window, make sure that the **Template Link Field** is set to: Borehole Name and the HDR Units to: Logs in Depth Units.

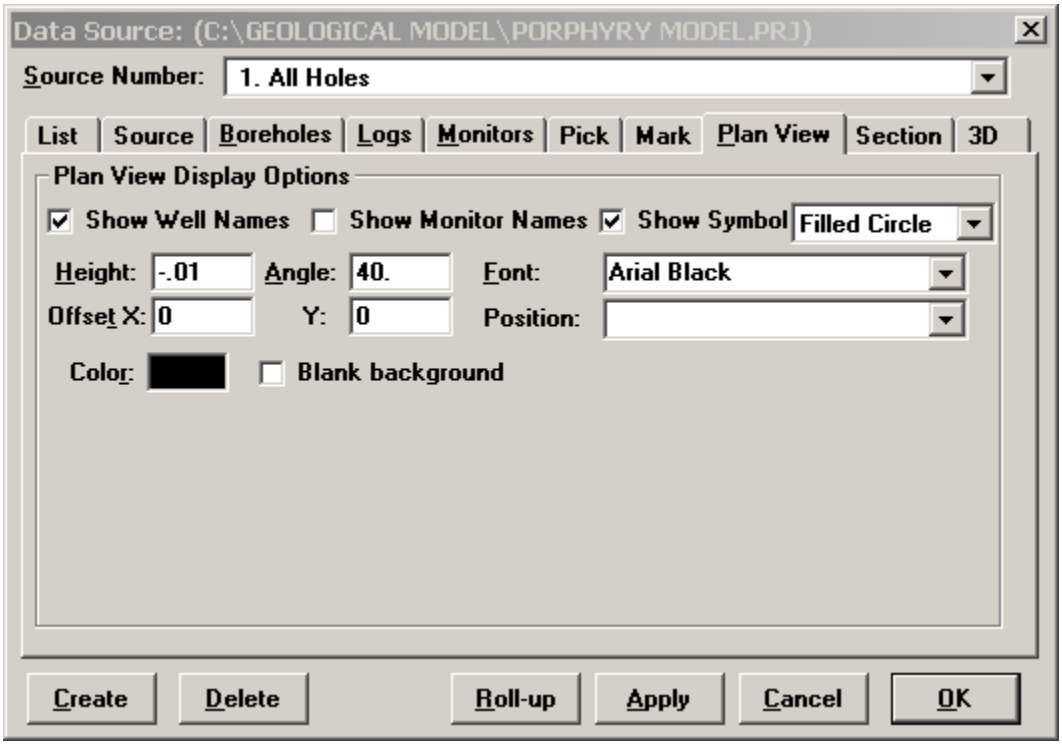
Data Source: The Plan View Tab

In the Data Source window, the **Plan View** tab is used for formatting and display of the borehole information on plan-view maps (see Data Source: Plan View Tab).

TASK: Modify the display of boreholes in the **Plan View** tab.

PROCEDURE:

1. From the following figure, complete the table.



The Plan View Tab in the Data Source Window.

2. The height of the object can be defined in two ways:

   Actual Height in World Coordinates: Enter the height and offset values in map units, such as metres or feet.

   Scaleable Height: By entering a negative height value the size of the text and symbol can automatically scale with the size of the viewport. For example, enter a height of –0.01 to scale the label and symbol to 1% of the visible map area. As you zoom in and out, the symbols will remain the same size.

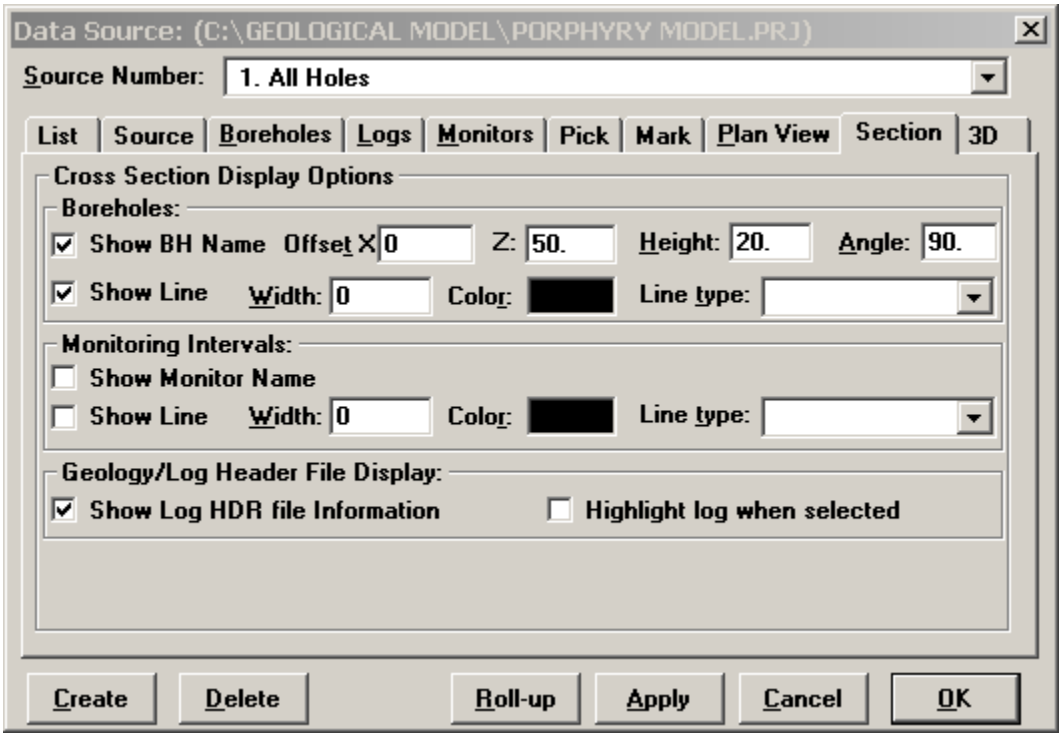
Data Source: The Section Tab

The **Section** tab controls the display of the well information on cross sections (see Data Source: Section Tab).

TASK: Modify the format of the display of boreholes in cross section in the **Section** tab.

PROCEDURE:

1. From the following figure, complete the table.



The Section tab of the Data Source window.

2. Height values are in World Coordinates (e.g., metres or feet). Checking the **Show Line** option draws a vertical line at the borehole position on the section. Monitoring zones can be displayed by choosing the **Show Line** option in the **Monitoring Intervals** section. Making the monitor line thicker, and a different color, than the borehole line provides an effective way to display the monitoring interval.
3. Geologic information at each borehole is displayed by enabling the **Show HDR file Information** check box.

Displaying Boreholes on the Map

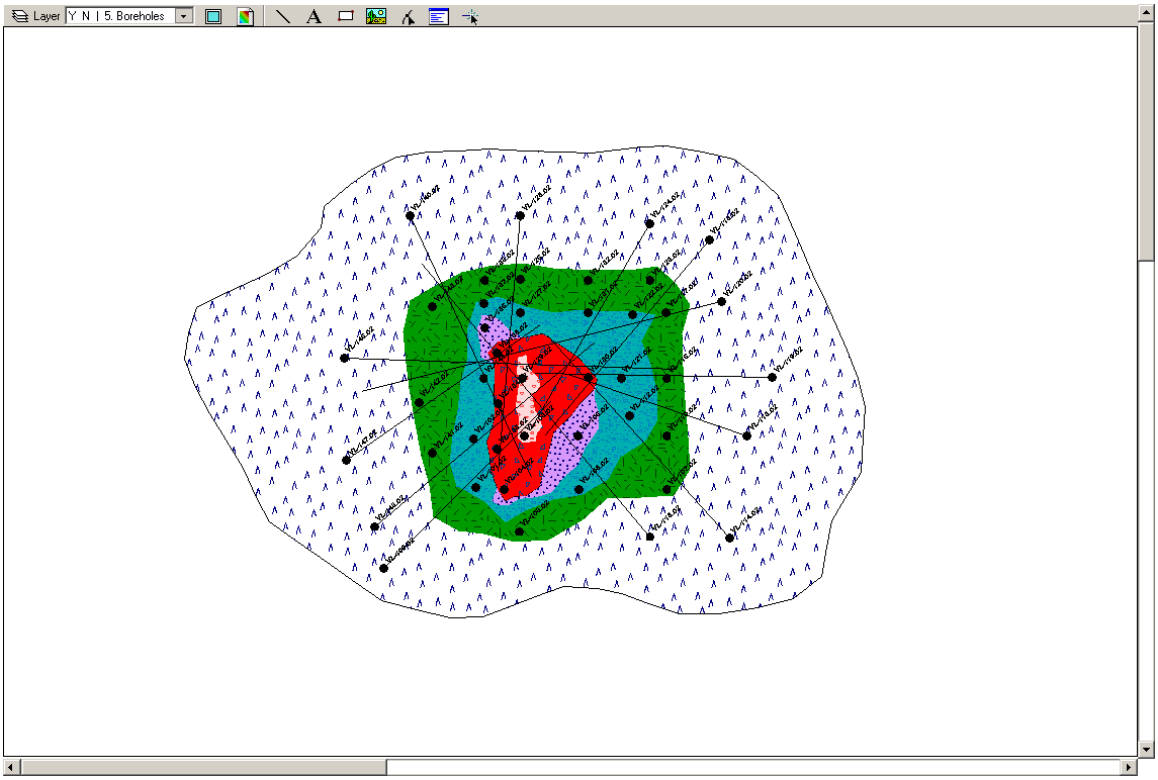
Once the above tasks have been completed, we are ready to display the boreholes on a plan-view map.

TASK: Display the Boreholes on the map.

PROCEDURE:

1. After completing all the tab information, click **Apply** and **OK** to close the Data Source window.
2. The Borehole Locations should now appear on your basemap. If they do not, open up the Data Source window again, go back to the List tab and make sure that the Data Source you just created (All Wells), has been activated (i.e., checked on).

> **Note:** If you have left in the filter criteria you will only see a portion of the boreholes displayed. It is **imperative** to remove the filter criteria for the remainder of the tutorials.



All boreholes displayed on the basemap.

Selecting and Editing Borehole Details

The borehole information, including ALL fields in the Data Source query or table, can be displayed within VIEWLOG as a floating table window. Because all fields in the table or query are available, the user can add easily add related fields for editing. Editing changes are immediately written back to the database.

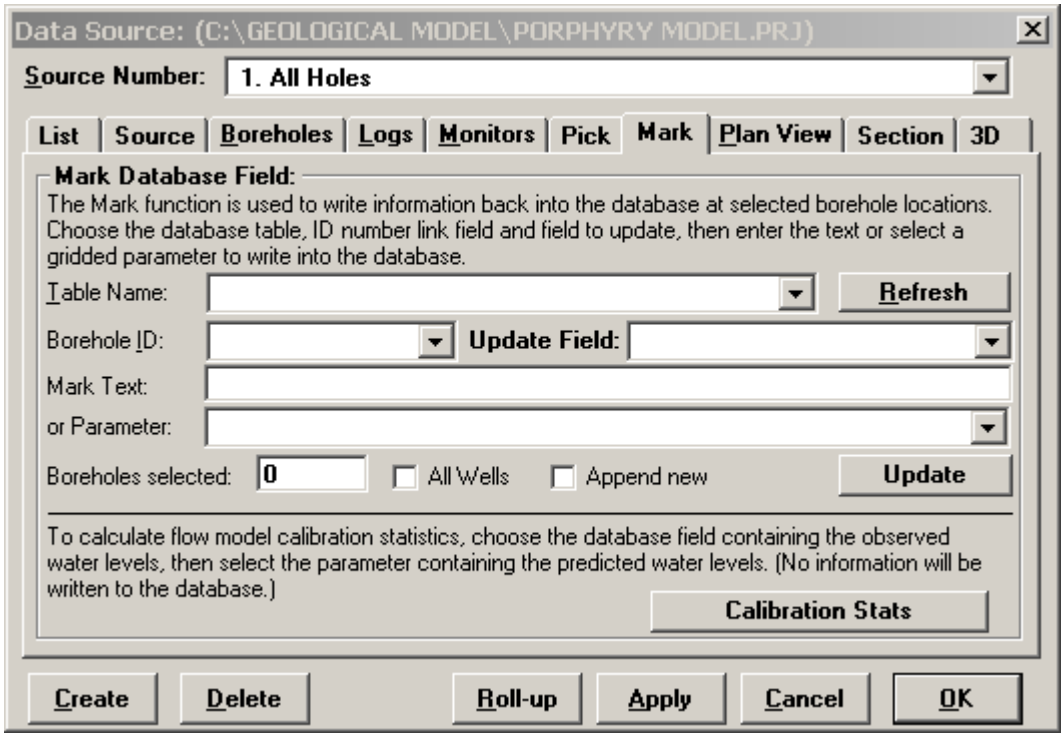
> **Note:** The following task is for information purposes only.

TASK: Select and edit Borehole Details.

PROCEDURE:

1. In World Coordinates, choose **Edit/**Select Objects (Shortcut: **F2**).
2. Double-click on a well to load the table window.
3. Subsequent well clicks will refresh the well information.
4. New boreholes can be added to a Data Source from the map using the following procedure:
   a. Choose **Edit/**Select Objects and click on an existing borehole in the Data Source. The grid window will open.
   b. Choose the **Draw/**Add Borehole command, and then click on the borehole location. The Borehole Attributes window will be opened, and the new borehole added.

5. Boreholes can be moved and transformed using the same procedure as that for editing other map objects such as lines and text.
6. The **Mark** tab (shown below) is used to write information back into the database at selected borehole locations (see Data Source: Mark Tab). Once a group of boreholes is selected, any text or numeric value can be overwritten into the field in the borehole table, or, the value of a gridded parameter can be written. Before using this feature, it is recommended that a blank table be created in MS-ACCESS. The information can then be written from VIEWLOG to the new, blank table.



The Mark tab in the Data Source window.

Creating a Cross Section with Boreholes

Creating cross sections is an integral part of any geological model.

TASK: Create a cross section with boreholes.

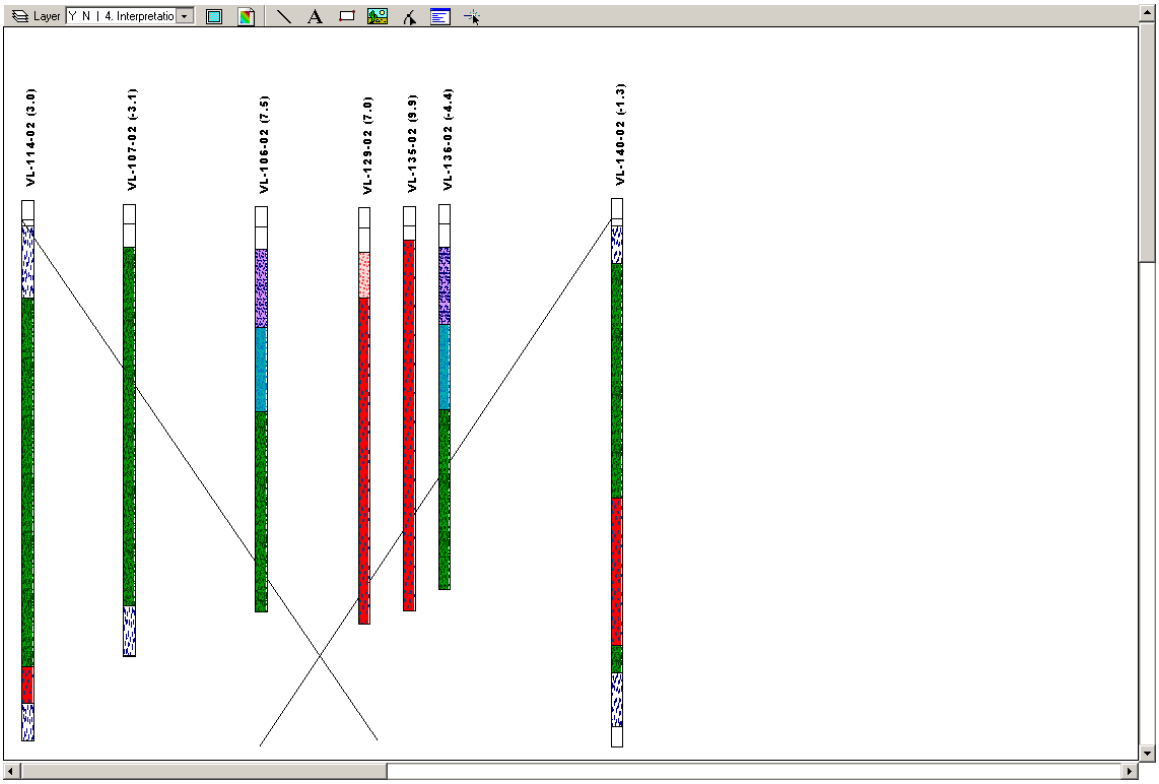
PROCEDURE:

1. Open the base map in World coordinates.
2. Create a new Layer called Cross Sections and make it current. Set it as the default Current drawing layer.
3. Make sure that the Data Source that you just created, All Wells, is activated (i.e., on the **List** tab it is checked on) and the current layer is the new cross Sections layer the student just created.
4. Select **Draw/**New Polyline and draw a polyline through the cluster of boreholes displayed on the map

5. Select **View/**Create Cross Section (or use the icon) and answer **Yes** to create the cross section. A series of boreholes should appear on the screen as shown below. If no boreholes appear, select **View/**Cross Section Setup, and increase the **Borehole Offset Distance** (try 50 or 100).

> **Note:** When in plan view, **View/**Cross Section Setup is used to set default cross-section values for the current VIEWLOG project. In a cross section map, **View/**Cross Section Setup will set values for only the current cross section.

6. You may also want to change the vertical exaggeration. This can be done with **View/**Cross Section Setup.
7. Creating a cross section will create a new *.MAP file which you can save for future use.



A sample cross section showing boreholes.

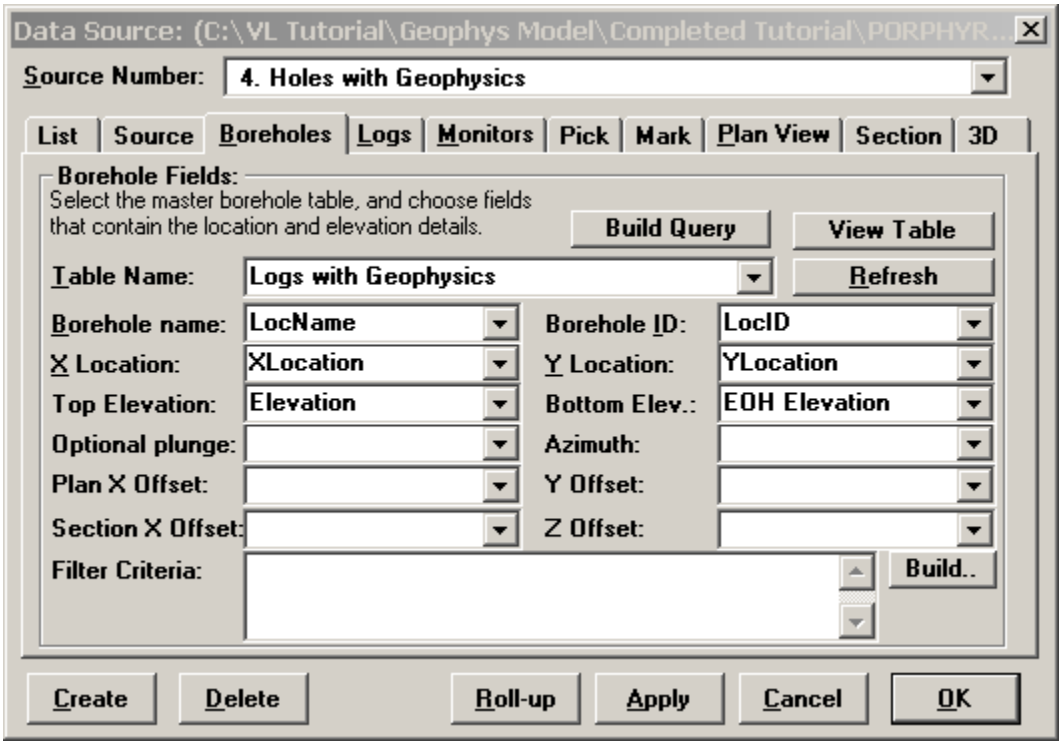
> **Note:** A series of cross sections have already been defined for the student. To view these cross sections turn on the Cross Sections Layer, i.e. open the layer menu and click on the light bulb. This will activate the defined Cross Sections. These cross sections have also been interpreted for the student as part of the geological model. To view these cross sections, choose **File/**Open Drawing File C:\VL Tutorial\Geophys Model\Completed Tutorial\Cross Section 1.map thru to Cross Section 4.map.

Creating a Data Source to show only the Holes with Geophysics

TASK: Create a new Data Source for the drill holes with geophysics.

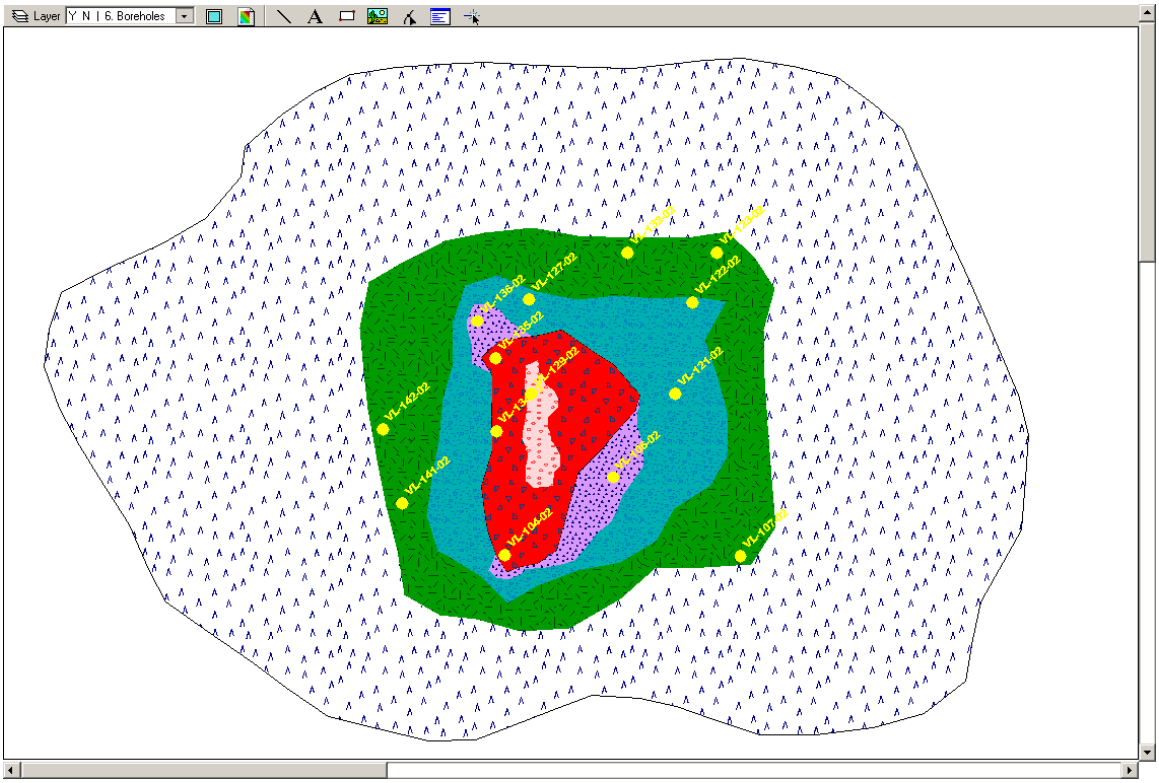
PROCEDURE:

1. On the **List** tab and **Source** tab create a new source and call it Holes with Geophysics, make sure it is activated on the boreholes layer.
2. On the **Boreholes** tab fill in the table as shown below.



Borehole tab on the Data Source Menu

3. On the **Logs** tab select the **Default Template HDR File** as "Geophysics Interpretation Template for Sections. This has already been provided for you.
4. On the **Plan View** tab, click on **Show Well Names** and change the **Color** to Yellow
5. On the **Section** tab click on **Show BH Name, Show Line** and **Show Log HDR file Information.**
6. Choose **OK.** The map should appear as below.



Basemap with displaying only the Holes with Geophysics.

Data Source Browser

TASK: View the geophysical logs from the basemap.

PROCEDURE:

1. In the Data Source window, click on the **Select** button in the Default HDR section. Select the HDR file; C:\VL Tutorial\Geophys Model\Geophysical Template.HDR

> **Note:** In the **Logs** tab, be sure that the **Template Link Field** is set to Borehole Name, because we're connecting with the LocName in the database.

2. Activate the new Data Source "Holes with geophysics".
3. Choose **Tools/**Show Source Browser Window
4. Click on a borehole on the basemap. The geophysical logs which were collected for that borehole will be displayed in the browser window.

Lesson 12: Working with VIEWLOG Grids

VIEWLOG grids are used to direct the interpolation process. Interpolation consists of two elements: a grid definition, and a file containing the interpolated results at each grid cell.In the Map Editor. The Project Data Menu contains the grid editing options. A grid definition includes information about the position and number of rows and columns in a grid. The interpolation process is controlled through the Data Parameter menu.

Creating and Displaying Grid Definitions

In general, it is good idea to carefully define (and refine) your grid definitions early in the project. Major changes to a grid later in a project may require that each parameter be re-interpolated to a revised grid definition. Re-interpolation is not a difficult task, but can take a lot of processing time.

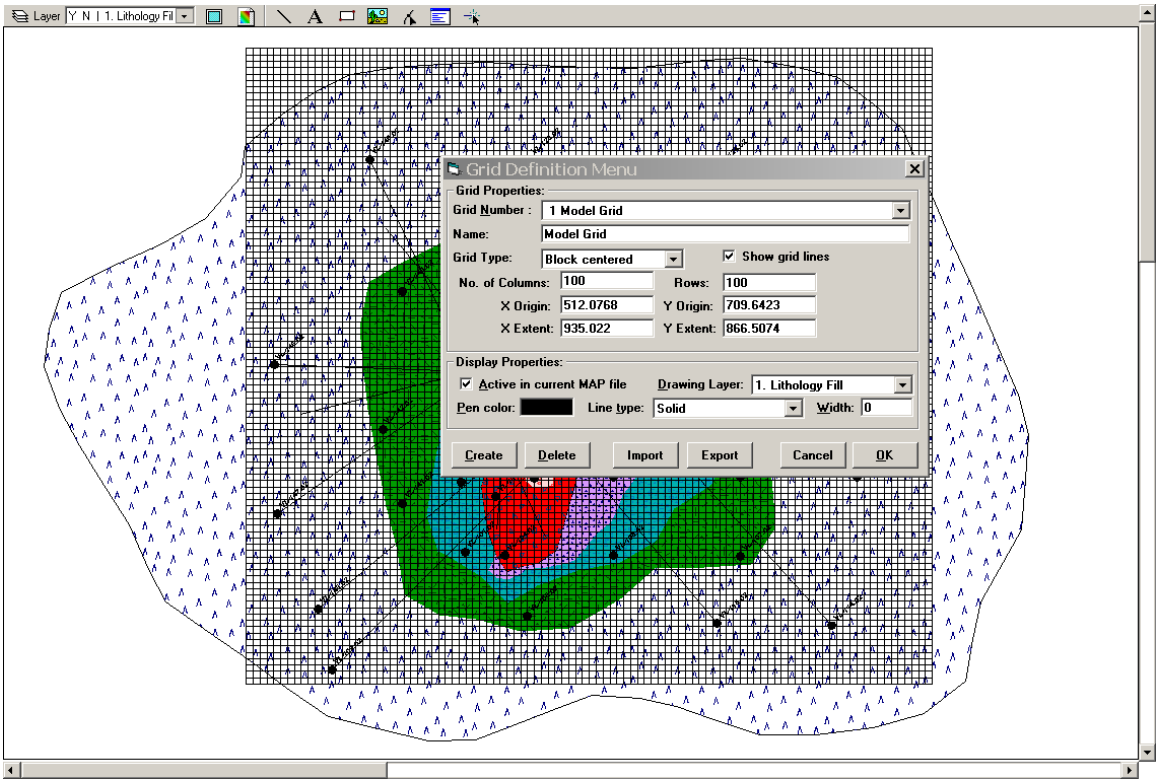
> **Note:** It is very important that you have completed the previous tutorials as the following two tutorials are based on the basemap, project links and Data Source that you have already completed.

TASK: Create a grid.

PROCEDURE:

1. Open Basemap.map in world coordinates and press **F5** to zoom out. (Remember that the **Esc** key cancels all current functions)
2. Create a new layer called Grid.
3. Set the Grid layer as the default Grid Definition layer.
4. Open the **Project Data/**Define New Grid and make a box around the boreholes shown on the map. Click **Yes** to create a new grid. You will get a message box that will display *"Invalid layer or grid extents. No changes made."* Choosing **OK** will bring up the grid definition menu. The error appears because VIEWLOG assumes that we are making a change to a previously defined grid definition, which is not the case.
5. Enter Model Grid as a **Grid Name**.
6. Fill in the appropriate information as shown below. Remember the importance of Layer definitions and make sure that the grid is defined on Layer Grid.
7. Click **OK**. The grid lines will appear map.
8. Select **Project Data/*Grid Properties*** and click off **Active in Current Map** file and click **OK.** This turns off the lines in the current map.

> **Note:** By Choosing **Project Data/**Define New Grid you can interactively define a grid shape by hold the left mouse button down and dragging a box over the desired area.



Grid Definitions

The **Create** button is used to create a new grid. After creating a new grid, it is a good idea to give it a descriptive name. The **Grid Number** list box is used to select which grid properties are displayed in the menu. There is no limit to the number of grids that can be created. Different grids can be used for different study areas in a large region. Alternatively, one grid can be used, and cell sizes adjusted or "refined" in areas of interest.

> **Note:** New grids are initially created with uniform cell sizes. The cell size depends on the number of rows and columns in the grid, along with the **X** and **Y Extent** (size) of the grid.

Moving a Grid

TASK: Move a grid.

PROCEDURE:

1. To move a grid, first select **Project Data/**Grid Properties.
2. Redefine the grid **X** and **Y Origin** in the **Grid Definition** window. The grid refinement, and all settings, will be preserved.

Editing and Refining a Grid

By default, grid definitions have uniform cell sizes. The ability to refine a grid is a very powerful feature, as it allows smaller cell sizes in areas of interest. For example, a grid with large cells could be defined to cover the entire study area, and then cell size can be refined in zones where

there are many boreholes. This provides detail only in zones of interest, and provides a seamless transition from the local to the regional scale.

TASK: Refine a grid.

PROCEDURE:

1. Select **Project Data/**Grid Properties and select the Regional grid just created. Activate the Grid on the map by clicking the **Active in current Map file** on.
2. Click **OK**.
3. Select **Project Data/Edit Grid/**Refine Region.
4. Click to define a box in which each cell will be sub-divided.

Note: Use this command carefully, for it can create many cells very quickly.

Lesson 13: Working with Data Parameters

A Data Parameter is used to manage any mappable field measurement. Examples include geologic surfaces, water level snapshots, rock properties, etc. The Data Parameter menu brings together a database link, gridding and interpolation details, and plan-view, section and 3-D display options.

Creating a New Data Parameter

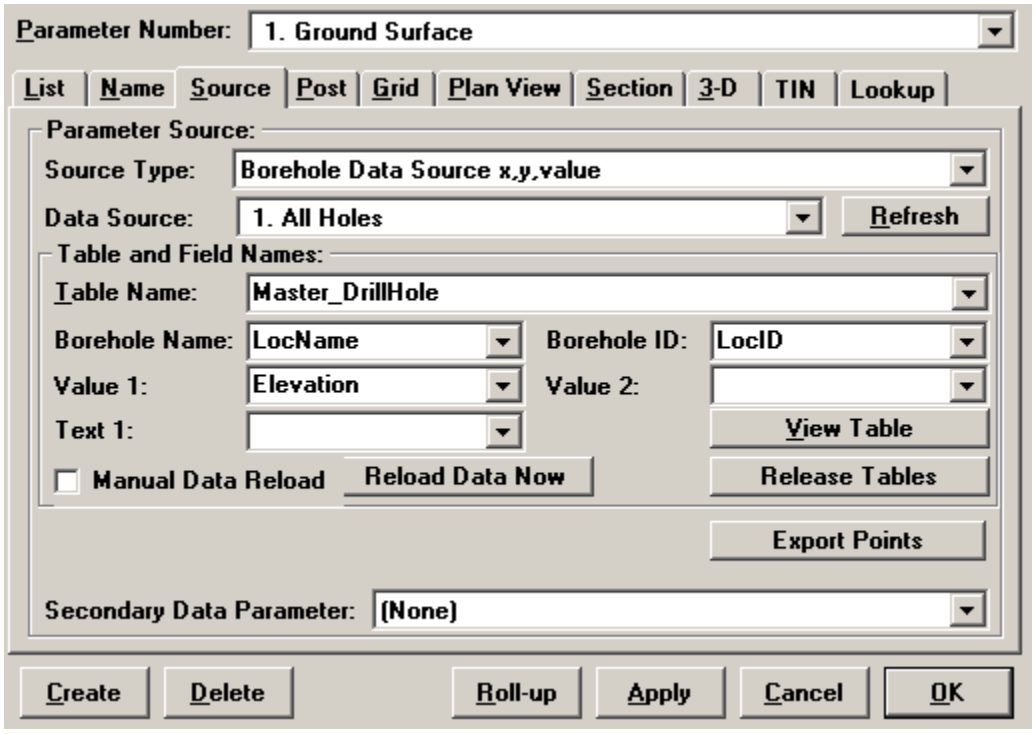
In this task we will create a Data Parameter by linking to the database.

TASK: Create a Data Parameter that is linked to the database.

PROCEDURE:

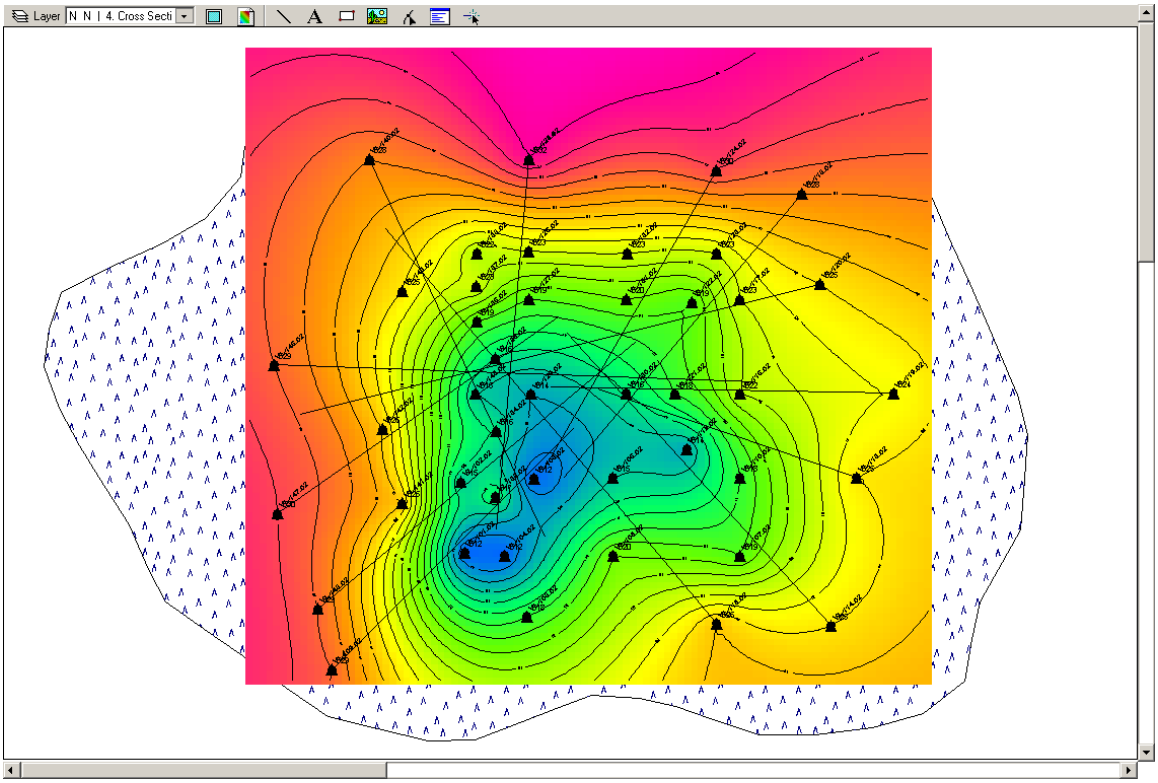
1. First, create a VIEWLOG layer called SURFACES. Open the Layer menu and hit the icon to create a new layer. Name this layer "Surfaces". Set this layer to the current layer by highlighting, then right clicking and selecting **Set to current layer**. Move this layer down to the 1. position by using the icon. Make this layer the **Default Parameter Layer**.
2. Open the Data Parameter window, and from the List tab, click on **Create**. Select **Yes** to replicate properties from the existing Data Parameter, and select **No** to append the new Data Parameter to the end of the parameter list.
3. In the **Name** tab, call this new parameter "Ground surface". Go back to the List tab, and place a check next to this new parameter. Make sure that the Parameter Number at the top of the window shows that the current parameter is 1. Ground Surface.
4. In the **Source** tab, fill out the table as shown below.

> **Note:** Hit the **Refresh** button once you've selected the Data Source.



The Source tab of the Data Parameter window.

5. Note that this Data Parameter is linked to the All Holes Data Source. In addition, this parameter is linked to a Table called Master_DrillHole.
6. In the **Post** tab, you can view the data points by checking the **Show Symbol** check box. Values can be posted by checking the **Post Value** check box.
7. On the **Grid** tab, link this new Parameter to the Grid called Model Grid.
8. In the **Grid** tab, enter the grid file as: C:\VL Tutorial\Geophys Model\Ground Surface.grd.
9. Krige the data by choosing the **Quick Krige** method. Then click on the **Krige** button. Once kriging is complete, click on **Apply**.
10. In the **Plan View** tab, click on **Auto Scale** to scale the contour limits to the data.
11. In the **Contour Line Display Options** turn on **Show Lines** and turn on **Label Contours** and turn on **show solid colour fill.**
12. You should see a figure that resembles that shown below.



The Gridded Ground Surface.

Clipping Gridded Data

Another useful feature is the use of a closed polygon to clip the data. This allows the user to show only gridded data within a desired area, and is done by creating a new Data Parameter on the same grid. In this new parameter, each cell will be assigned either a 1 or a 0; areas assigned to 0 will not be shown.

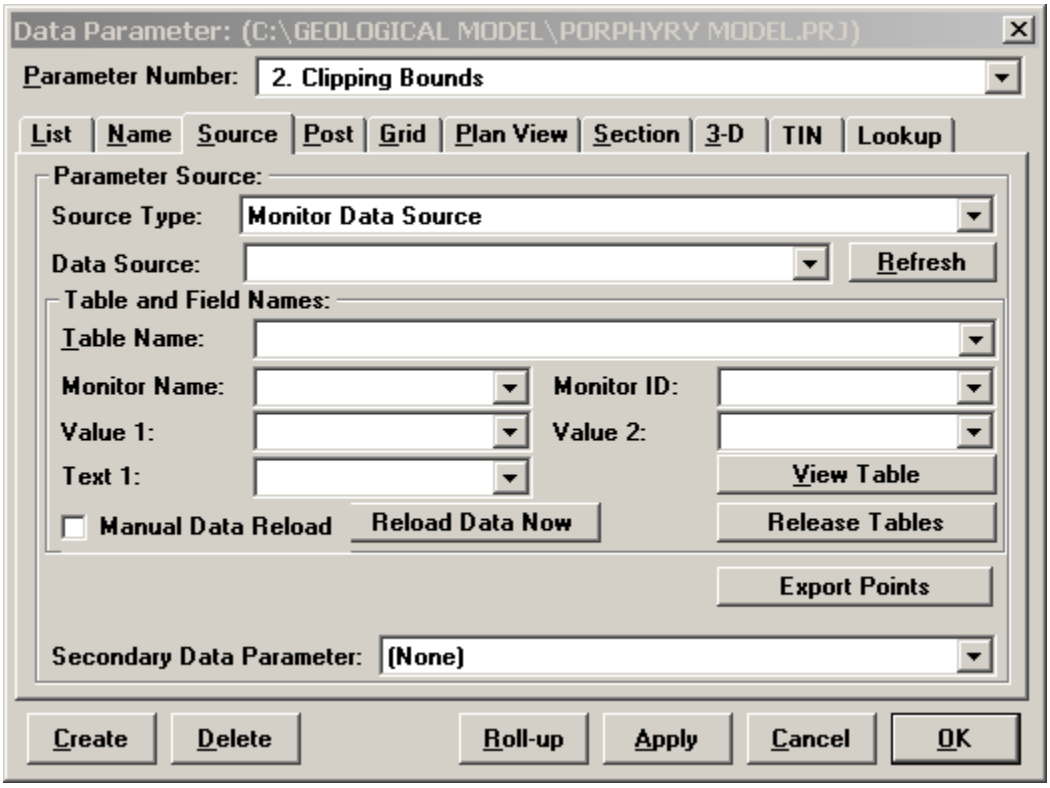
TASK: Clip the Ground Surface Gridded Data.

PROCEDURE:

1. First, create a VIEWLOG layer called Clipping Bounds. Open the Layer menu and hit the icon to create a new layer. Name this layer "Clipping Bounds". Set this layer to the current layer by highlighting, then right clicking and selecting **Set to current layer**.
2. You can create your own clipping bounds by using **Draw/**New Polyline or use the outside boundary of the country rock. When you have created your polyline, right click to open the **Properties** window. Make sure your polyline is "closed". Also try to keep the polyline within the new grid map we made in the previous exercise.
3. We now need to create a Data Parameter that will be used to clip the Ground Surface data. In this case, all cells in this new Data Parameter will be either a 0 or a 1. Where a cell is assigned a 1, the ground surface will be shown; where a 0 exists, it will not be shown. To create a new Data Parameter, select **Project Data/**Data Parameter, and click on the **Create** button. Select **No**, when asked if you want to

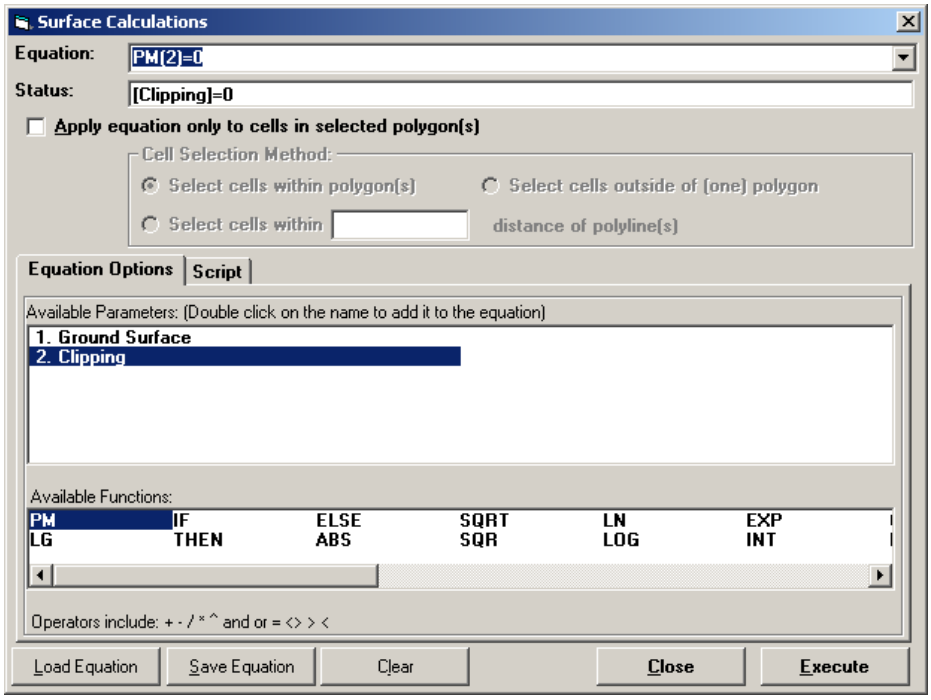
replicate an existing Data Parameter, and select **No** to append the new parameter to the bottom of the list.

4. In the **Name** tab, call this new Data Parameter '"Clipping Bounds".
5. On the **Source** tab make sure that there are no connections to any **Data Source** or **Table Name**. See figure below.



Source Tab on the Data Parameter Menu.

6. On the **Grid** tab, link this new Parameter to the Grid called Model Grid. Select the ... button to create a new grid file called C:\VL Tutorial\Geophys Model\Clip.grd, and click **Apply**. Close the Data Parameter window.
7. Open **Tools/**Parameter Calculator.
8. Fill out the equation line as shown below. This will assign a value of 0 to all cells:



Assigning a constant value to a grid with the Parameter Calculator.

9. Click on **Execute**, and click **Yes** to create the new grid file. You have now created a grid file where all cells are assigned a value of 0.

10. The next step is to assign a value of 1 to all cells within the clipping polygon.

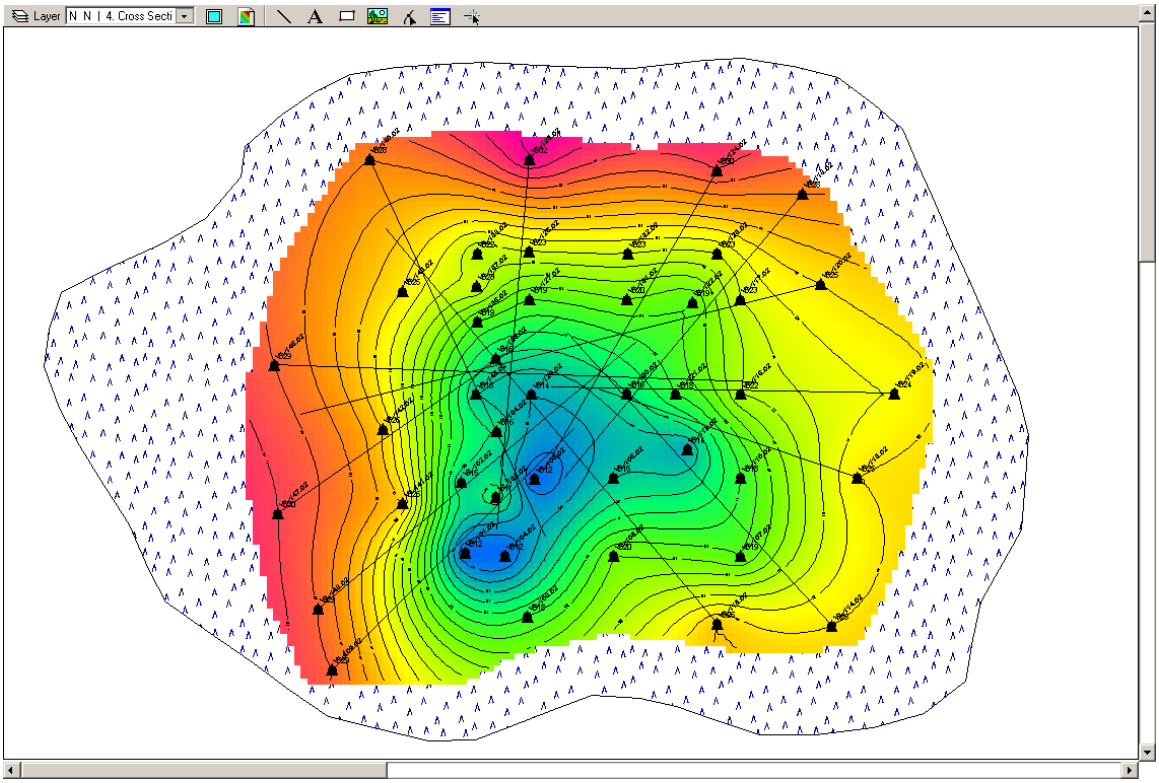
Make sure the clipping polygon is selected.

Open **Tools/**Parameter Calculator, and in the Equation: line, type PM (2) = 1. Make sure you place a check beside the **Apply equation only to cells in selected polygon(s)** box; otherwise, you will be assigning a 1 to all cells!

Click on **Execute**, and click **Yes** to update the grid file.

11. Open the Data Parameter window and select the Ground Surface parameter. Select the **Grid** tab, and set the **Bounds** to 2. Clipping bounds and select **Krige**.

12. The clipped ground surface should resemble that shown below.



Clipped Ground Surface.

Generating Additional Surfaces

You can now create Data Parameters as shown below. The database queries that are required for each Data Parameter are also listed:

Data Parameter	Database Query	Grid File
Bottom of Overburden	Bottom of Overburden	Bottom of Overburden

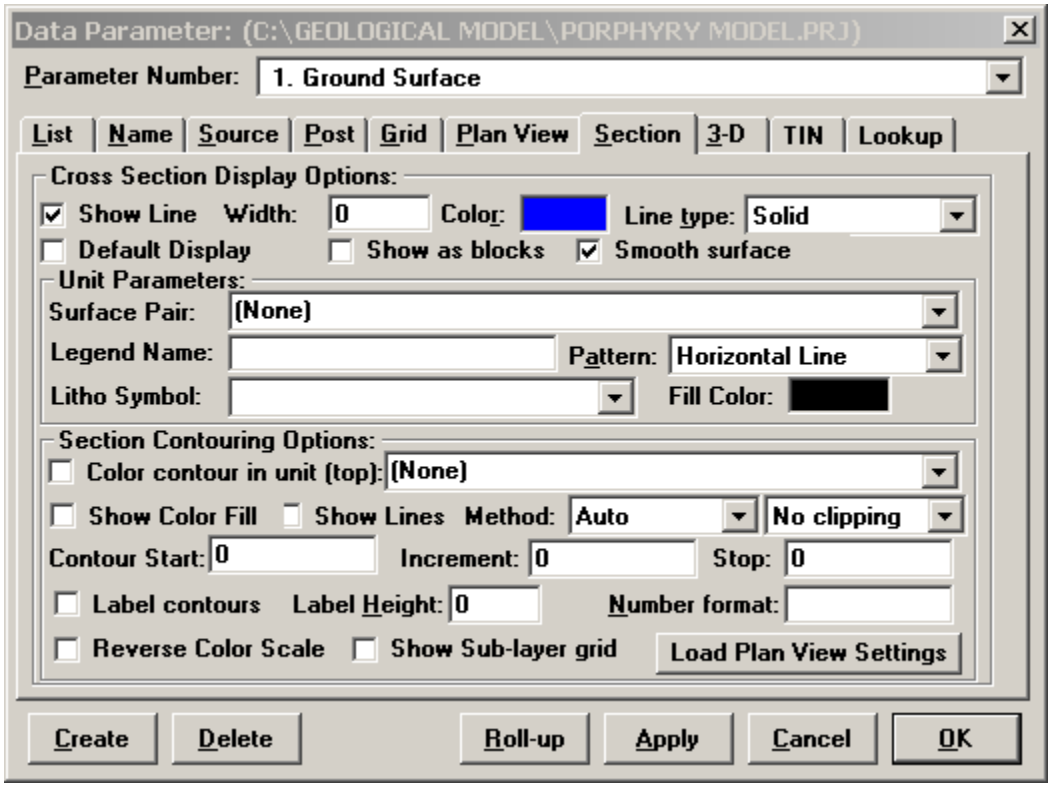
Preparing a Cross Section with Surfaces

TASK: Generate a cross section.

PROCEDURE:

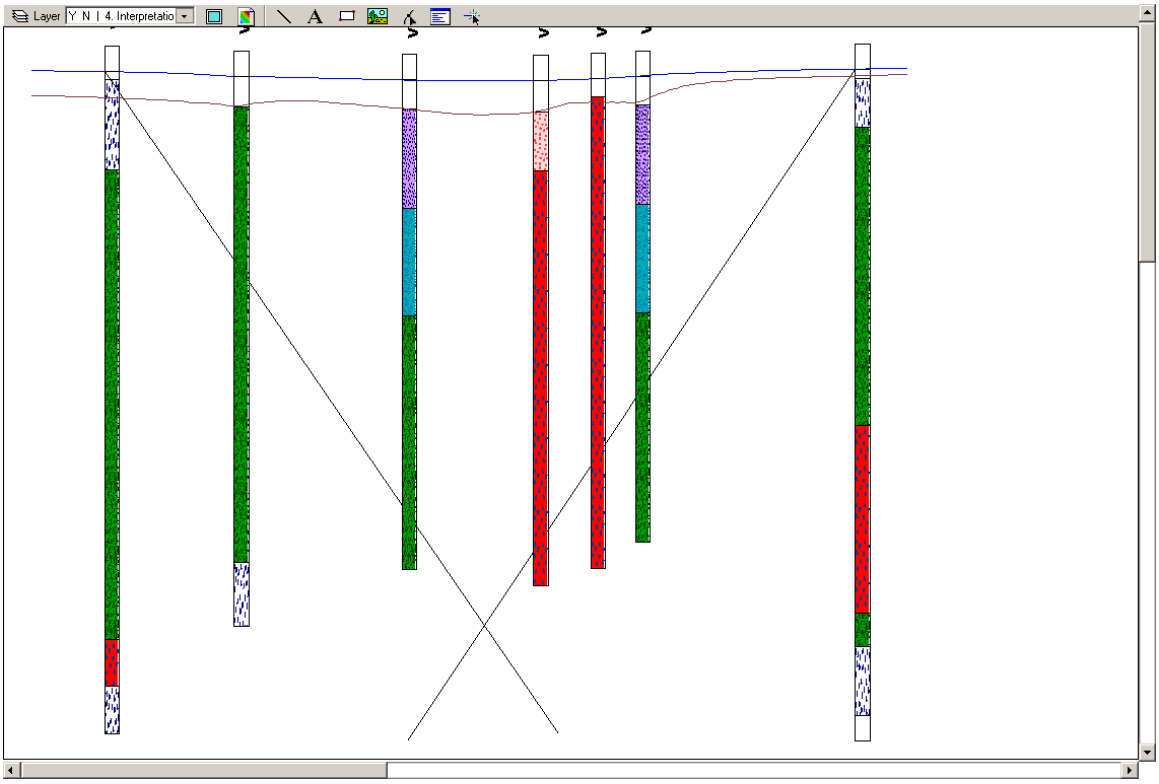
1. Completed on your Basemap.map in World Coordinates, deactivate all of the Data Parameters.
2. Set the current layer as Cross Sections.
3. Select **Draw/**New Polyline and draw a line through a cluster of boreholes from the Northwest to Southeast, intersecting as many boreholes as you can.
4. Choose **Edit/**Select Objects (or click **F2**) to select the line you just created.

5. Select **View/**Create Cross Section and choose **Yes**. A cross section of the boreholes should appear. If the boreholes do not appear, zoom in on a portion of the cross section.
6. Section lines for each formation can be edited in the **Section** tab of the Data Parameter window, as shown in the following figure.



Changing the color of a cross section line.

7. The figure below shows a sample cross section with Data Parameters shown. Make sure that the new Data Parameter is activated (checked on in the **List** tab).



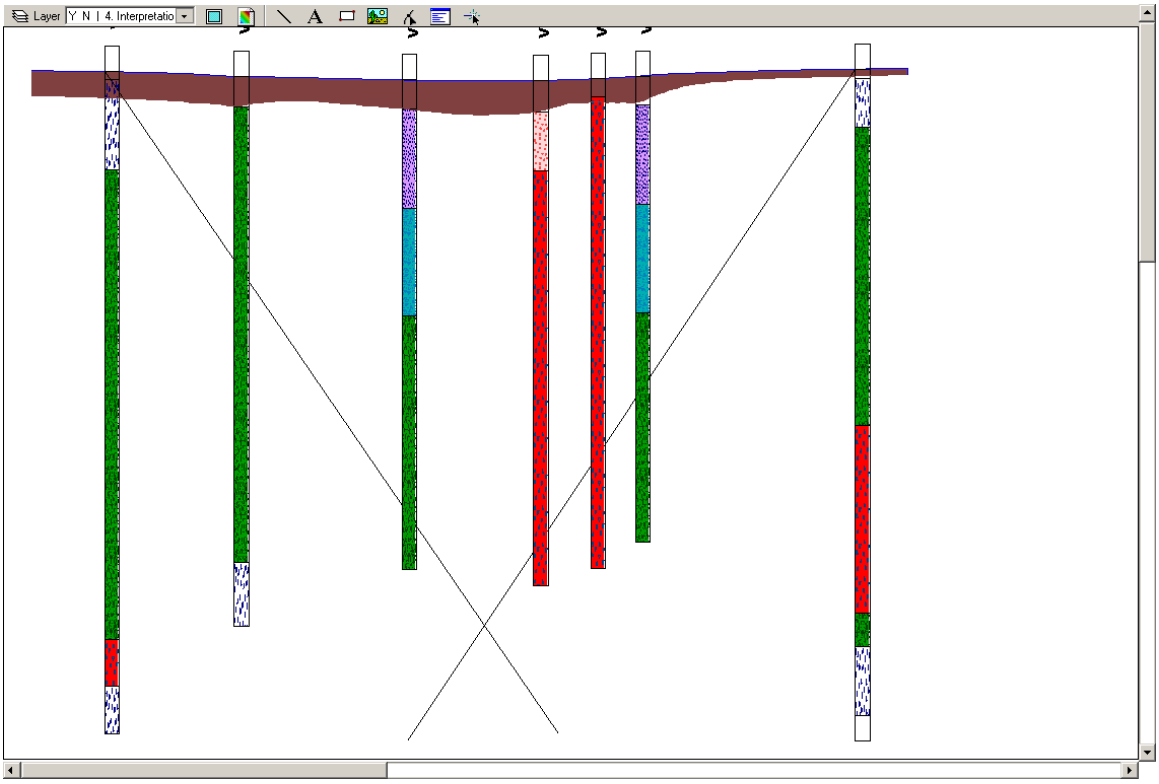
Cross Section showing formation lines and boreholes.

Creating a Cross Section – Surface Pairing

TASK: Creating Surface Pairs.

PROCEDURE: Open the Data Parameter menu and activate the Ground Surface Data Parameter, and the bottom of Overburden parameter. Zoom out to view the entire map.

1. In the **List** tab, select the Ground Surface parameter by highlighting it.
2. On the **Section** tab, in the **Unit Parameters-Surface Pair** drop down menu, select Bottom of Overburden
3. Change the **Fill Color** to brown, select **Apply** or **OK.**
4. Your new figure should resemble the following:



Cross Section with Parameter Pairing.

5. Save your cross section as C:\VL Tutorial\GeoModelTutorial\Section.map

Registering Cross Section(s)

It is important to remember to register your Basemap(s) and Cross Sections in the Project Manager.

TASK: Register the Cross Section.

PROCEDURE:

1. Make sure that the C:\VL Tutorial\GeoModelTutorial\Section.map that you created in the previous tutorial is still open.
2. Select **Project Data/**Project Manager.
3. Select the icon and select Register Cross Section(s).
4. Select C:\VL Tutorial\Geophys Model\Section.map and select **Open**.

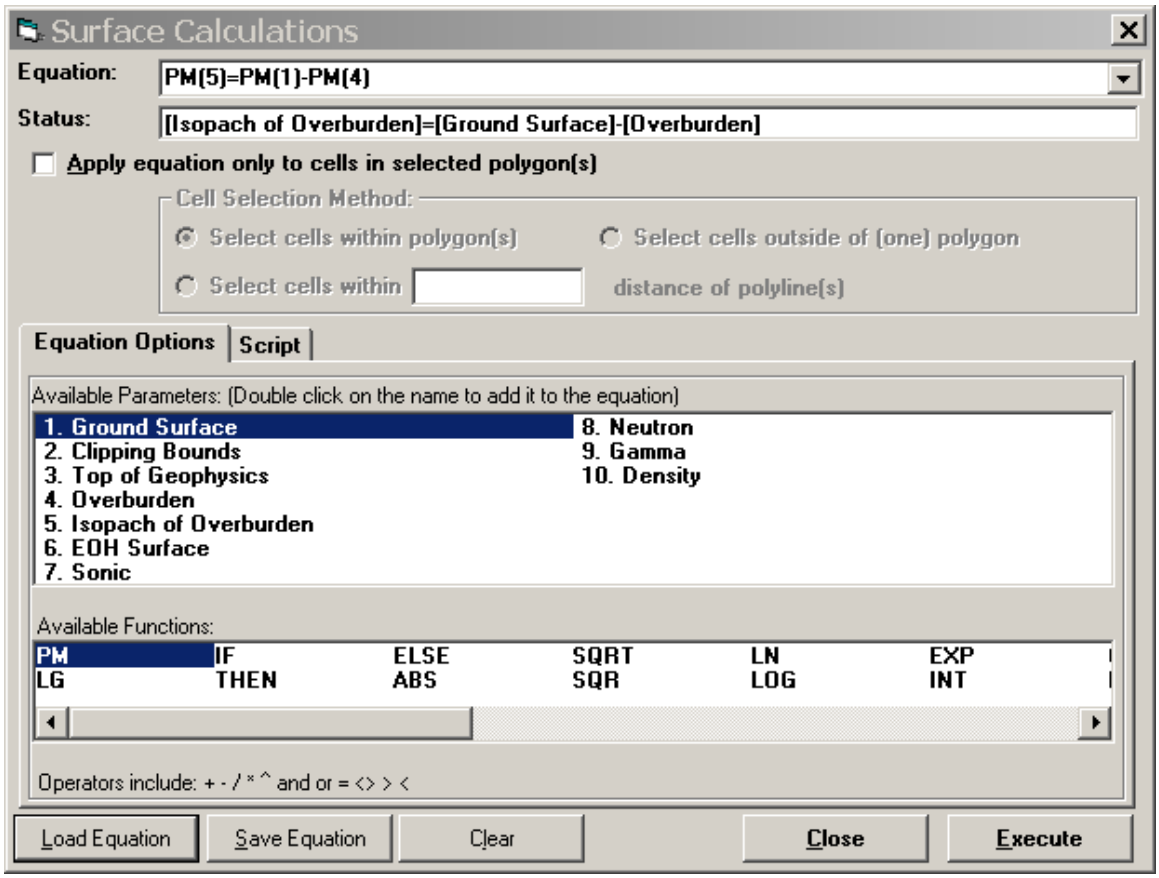
Creating an Isopach Map

In this task, we will examine another use of the Parameter Calculator. Specifically, we will take the difference in elevation between two geologic surfaces to create a parameter that contains the thickness of a unit. This is referred to as an isopach map.

TASK: Generate an Isopach Map of the Overburden.

PROCEDURE:

1. The **List** tab, click off (deactivate) all of the selected parameters.
2. Select Bottom of Overburden.
3. Select **Create**, select **Yes** to replicate all current settings and **No** to append the new parameter to the end of the list.
4. Turn off (deactivate) the Bottom of Overburden parameter, and activate the new parameter (at the bottom of the list).
5. On the **Name** tab, rename this new parameter Isopach of Overburden.
6. On the **Grid** tab change the grid file name to Isopach of Overburden.grd
7. Click on **Apply**, and close the Data Parameter window.
8. Choose **Tools/**Parameter Calculator.
9. Choose **Apply equation only to cells in selected polygon(s)** and click **Select cells within polygon(s)**.
10. Complete the **Parameter Calculator** window as follows:



Parameter Calculator for Isopach calculation.

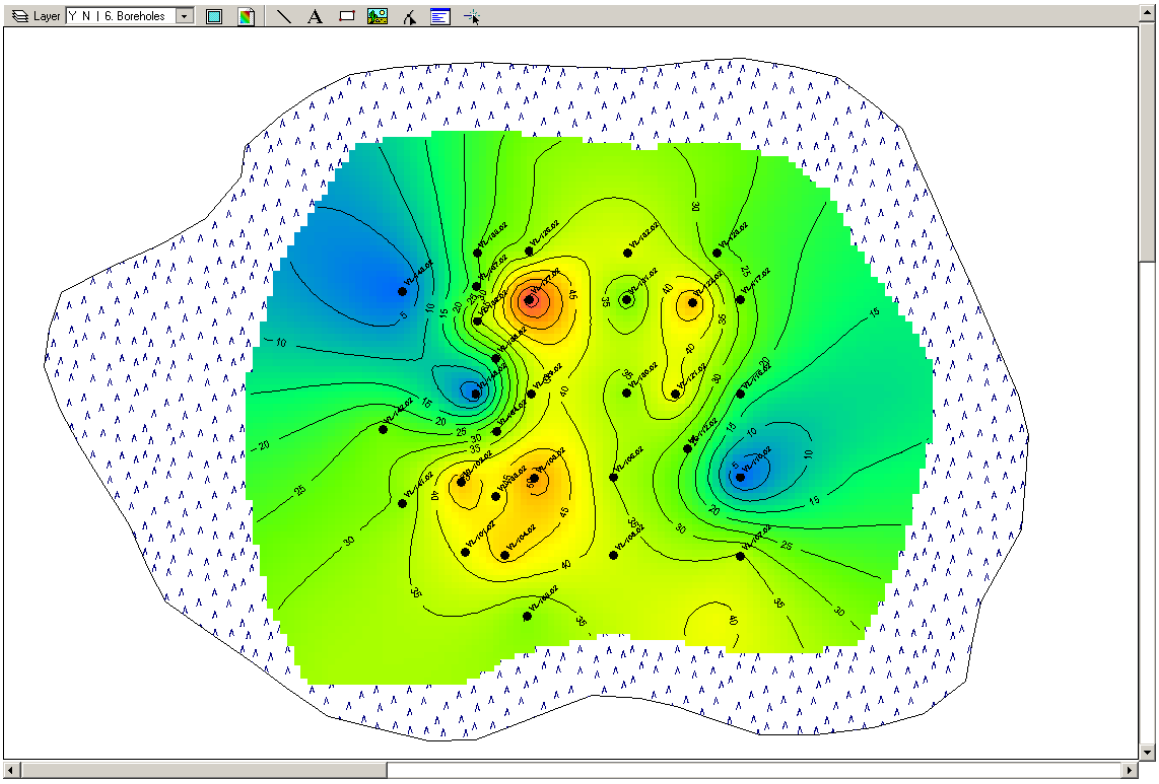
> **Note:** The above diagram has a few more Data Parameters that the user will have generated to this point. The other parameters are generated in the following sections.

Equation: PM(5)=PM(1)-PM(2)

Status: [Isopach of Overburden]=[Ground Surface]-[Bottom of Overburden]

> **Note:** Your parameter numbers may not exactly coincide with those shown here. When typing in the equation, you can use both keyboard entries and double-clicks on the desired parameter from the list of available parameters.

11. Click **Execute**. Make sure the new parameter you just created is activated. On the **Plan View** tab set the **Contour Start** to 0 and **Stop** at 80. Make sure the **Color Palette** is set to **Blue-Red Spectrum**. The following figure shows the isopach map.



Isopach map of the Hawthorn Formation.

Lesson 14: Gridding on Section

With the availability of downhole geophysics, it may become important to krige the physical property values on section as a method of visualizing the changes in physical properties across a given section.

Generating New Data Parameters for Gridding on Section

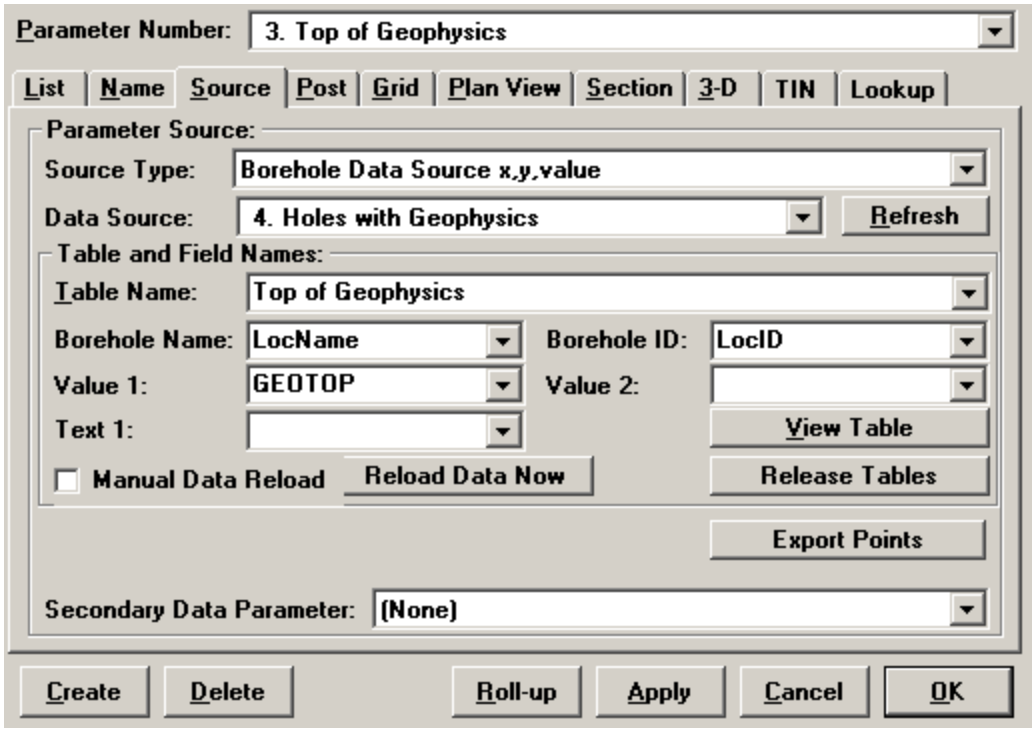
A number of new Data Parameters must be generated in order for us to complete this task.

TASK: Create a Data Parameter for the top of Geophysics

> **Note:** It is important when we grid the geophysical data that we do not include the signatures of the overburden (or casing) as the values tend to bias the colour contouring.

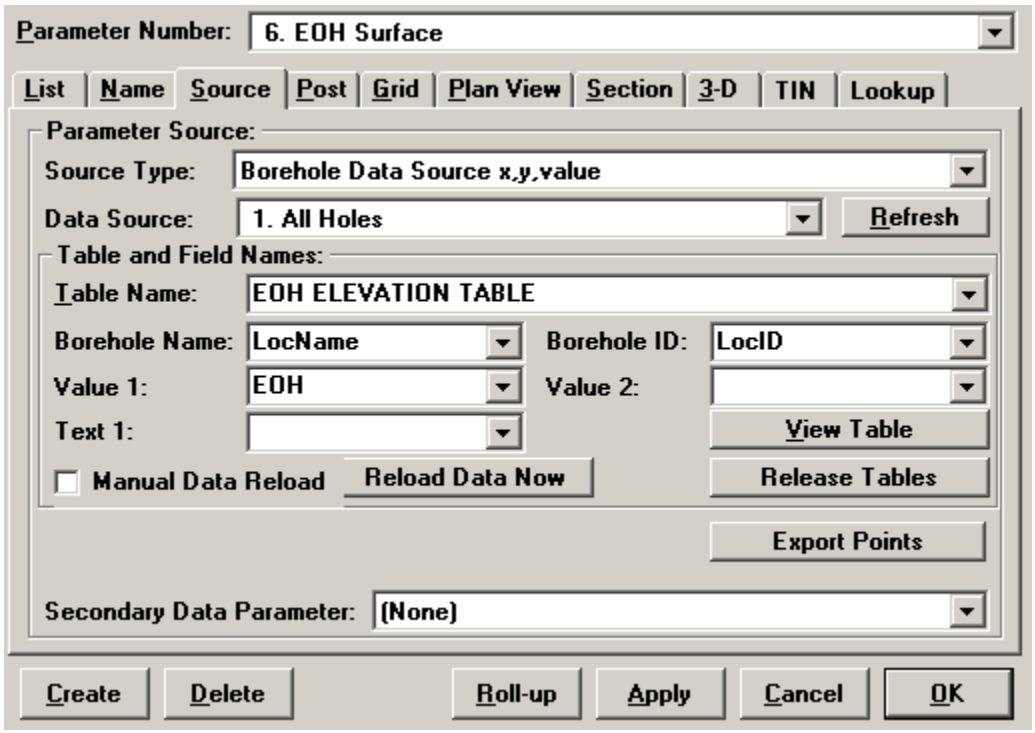
PROCEDURE:

1. Activate the "Holes with Geophysics" in the Data Source menu.
2. Create a new **Data Parameter** called Top of Geophysics. Please refer to Lesson 13: Working with Data Parameters on the specific details on how to create a new Data Parameter. Activate the new parameter by clicking it on.
3. On the **Source** tab fill out the fields as shown below. The query for "Top of Geophysics" has been provided for the student.



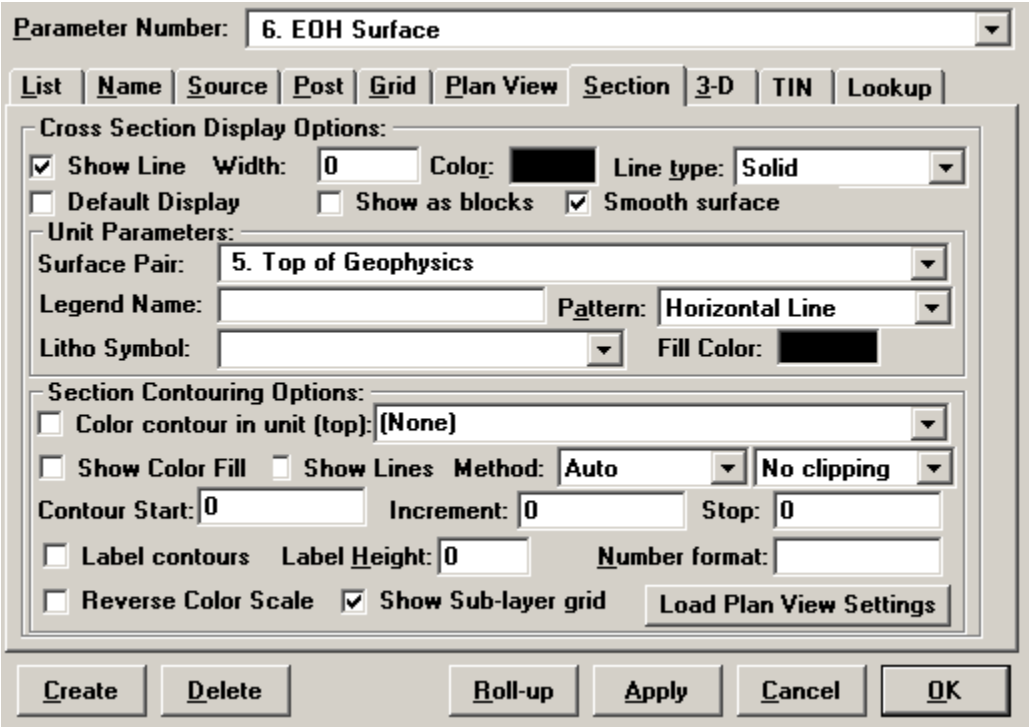
The Source tab on the Data Parameter menu

4. On the **Grid** tab, set the **Link to Grid** to 1. Model Grid.
5. Change the **File** name to Top of Geophysics.grd. and select **Krige**.
6. Now we will have to create an EOH (End of Hole) Surface parameter. Follow the same procedures as listed above for the **List** and **Name** tabs. Fill in the **Source** tab as shown below. The query for EOH surface has been provided for the student.



Source tab on the Data Parameter menu.

7. On the **Grid** tab, **Link the Grid** to 1. Model Grid and name the new grid file EOH Surface.grd. Click on the **Krige** button.
8. Now on the **Section** tab pair the EOH Surface with the Top of Geophysics as shown below.


Parameter Number: 6. EOH Surface
List | Name | Source | Post | Grid | Plan View | Section | 3-D | TIN | Lookup
Cross Section Display Options:
Show Line Width: 0 Color: Line type: Solid
Default Display Show as blocks Smooth surface
Unit Parameters:
Surface Pair: 5. Top of Geophysics
Legend Name: Pattern: Horizontal Line
Litho Symbol: Fill Color:
Section Contouring Options:
Color contour in unit (top): (None)
Show Color Fill Show Lines Method: Auto No clipping
Contour Start: 0 Increment: 0 Stop: 0
Label contours Label Height: 0 Number format:
Reverse Color Scale Show Sub-layer grid Load Plan View Settings
Create Delete Roll-up Apply Cancel OK

Section tab on the Data Parameter menu.

Generating a Cross Section for Section Gridding

We have to now choose an appropriate cross section that will allow for the best example of section gridding.

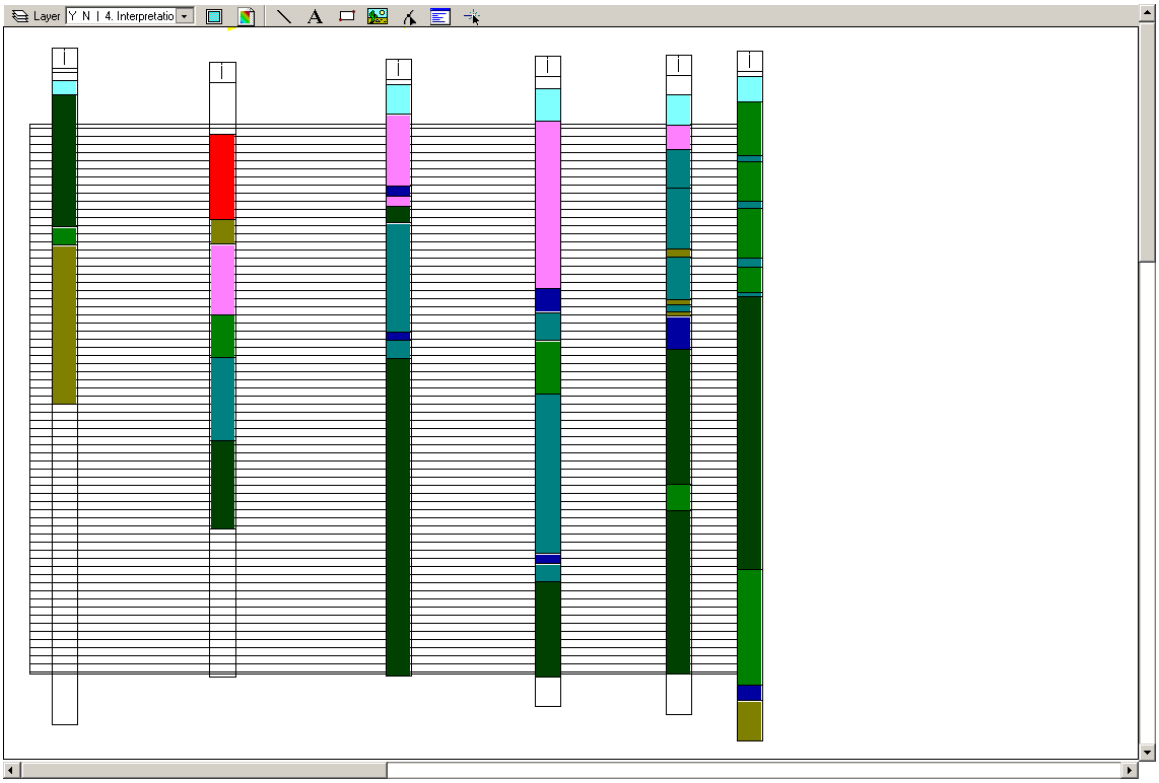
TASK: Generate a new cross section.

PROCEDURE:

1. Open the base map in World coordinates.
2. Activate the Cross Section layer and make it current. Set it as the default Current drawing layer.
3. Make sure that the Data Source that you just created, Hole with Geophysics, is activated (i.e., on the List tab it is checked on) and the current layer is the new cross Sections layer the student just created.
4. Make sure that the two new Data Parameters, Top of Geophysics and EOH Surface are activated.
5. Select **Draw/**New Polyline and draw a polyline through the cluster of boreholes displayed on the map. Start in the Southwest corner and proceed to the Northeast corner, choosing the following wells VI-141-02,VI-104-02, VI-106-02, VI-121-02, VI-122-02 and VI-123-02
6. Select **View/**Create Cross Section (or use the icon) and answer **Yes** to create the cross section. A series of boreholes should appear on the screen as shown below. If no boreholes appear, select **View/**Cross Section Setup, and increase the **Borehole Offset Distance** (try 50 or 100).

> **Note:** When in plan view, **View/**Cross Section Setup is used to set default cross-section values for the current VIEWLOG project. In a cross section map, **View/**Cross Section Setup will set values for only the current cross section.

7. Save the new cross section as Neutron Section.Map.



Cross Section in preparation for the geophysics section.

Generating a Data Parameter for Neutron values

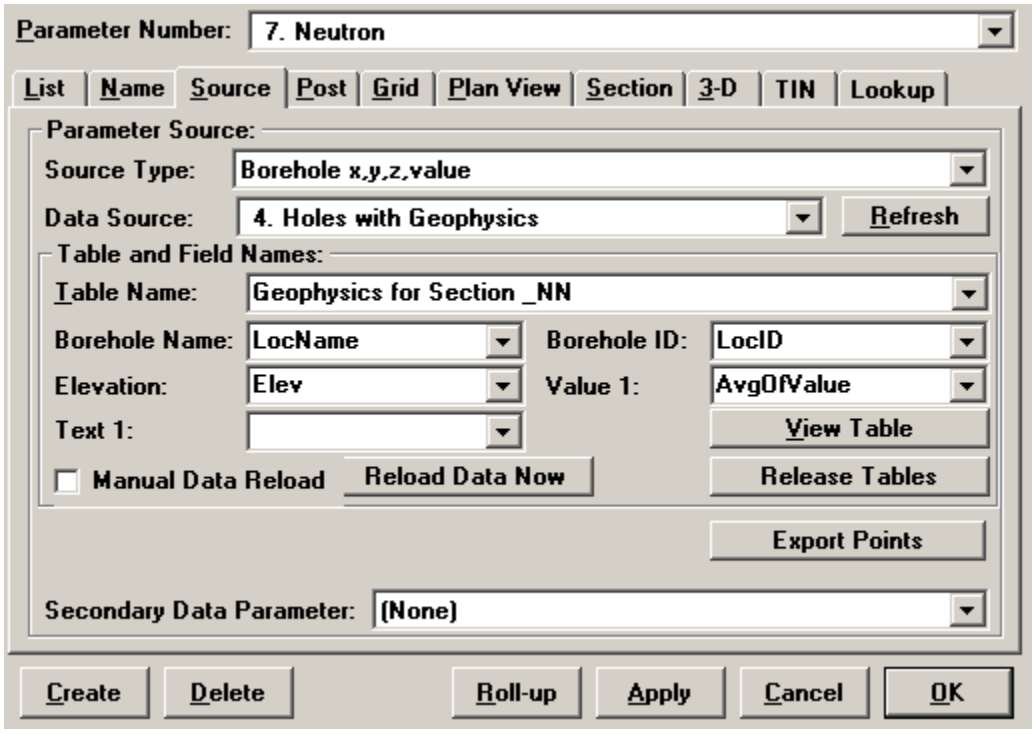
We have created a section with a top and a bottom surface for which we now can krige Neutron values.

TASK: Generate a new Data Parameter for Neutron.

PROCEDURE:

1. Open the Data Parameter menu and create a new parameter called Neutron, using the **List** and **Name** tabs. Make sure that it is checked on (Activated).
2. On the **Source** tab fill in the fields as shown below. The query for isolating Neutron values from the downhole geophysics has been provided for the student.

> **Note:** It is important to note that the **Source Type** that we will be using for this task has changed to now include the z values.

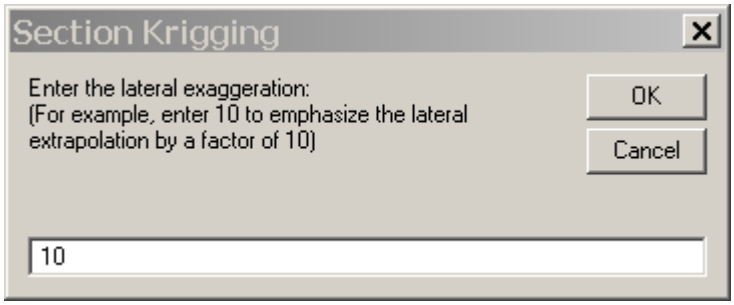


The Source tab on the Data Parameter menu.

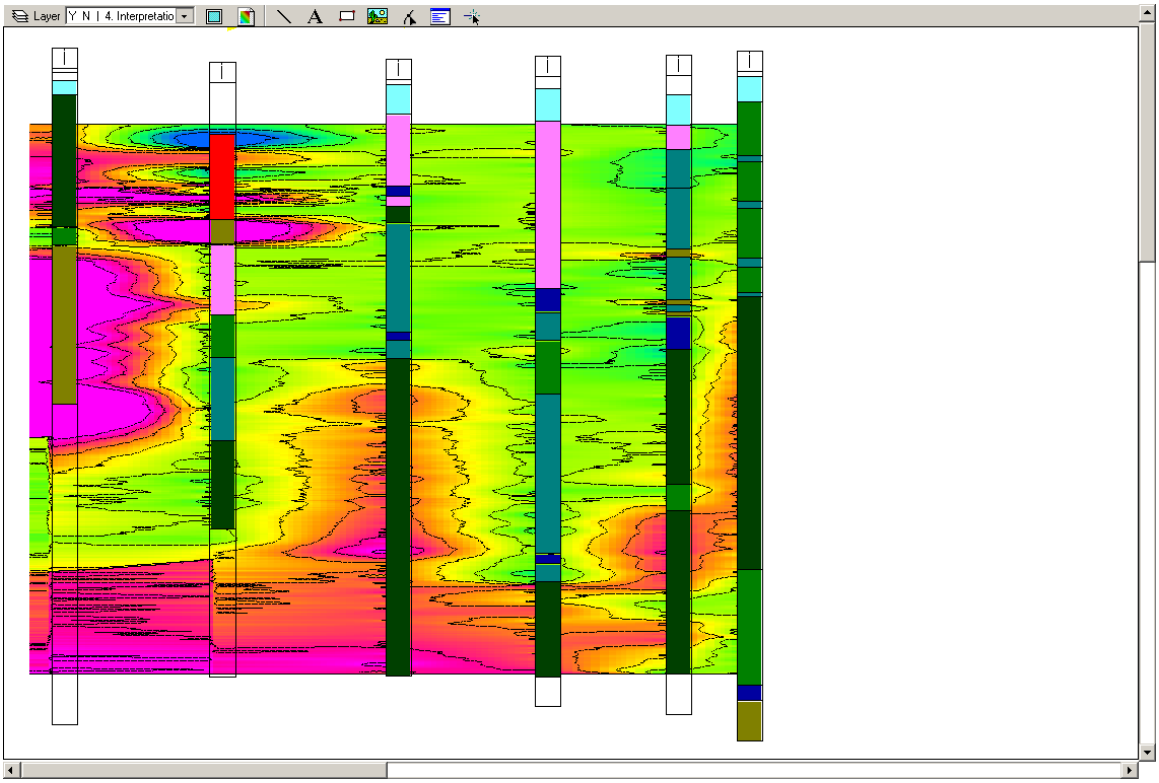
3. On the **Post** tab click on **Post Value** in the **Cross Section Posting Options** section. If the values have been displayed, uncheck the **Post Value** check box.

> **Note:** If the values are not being displayed, return to the **Source** tab and bring in the data source again and click the refresh tab. You can also check that the data is being brought in by clicking on the **View Table** button. This will display the query result.

4. On the **Grid** tab, **Link to Grid** 1. Model Grid
5. Change the file name to Neutron Section.grd
6. Change the **Sub-Layers** to 500
7. Change the **Method** to **Full Kriging** in the Interpolation Options section.
8. On the **Section** tab in the **Section Contouring Options**, select **Colour Contour in unit(top) 6. EOH Surface**. Make sure that it is checked on.
9. Click on, **Show Colour Fill** and **Show Lines**.
10. Change the **Contour Start** to 500, the **Increment** to 100 and the **Stop** to 1200
11. Go back to the **Grid** tab and select **Krige**.
12. A new window will appear, asking the student to select the amount of lateral exaggeration. This value is dependent on the lateral spacing of the boreholes. For our purposes will we be using a lateral exaggeration of 10. Select **OK**.



Lateral Exaggeration menu for kriging sections.



Neutron section.

Note: A variety of queries have been provided for you to continue to make other geophysical sections using Sonic Velocity , Natural Gamma etc. If you proceed to make more geophysical cross section, each new physical property will require a new Data Parameter. A simple method doing this, is to replicate the Neutron parameter and change the name to the appropriate physical property. On the **Source** tab link to the new query and remember to change the grd file name as well.

Lesson 15: Log Data Stored as Binary files

Often when there is a large amount of downhole geophysical information if stored in ASCCI file format, the database can become exceedingly large very quickly. Viewlog offers the option to store this data in binary format.

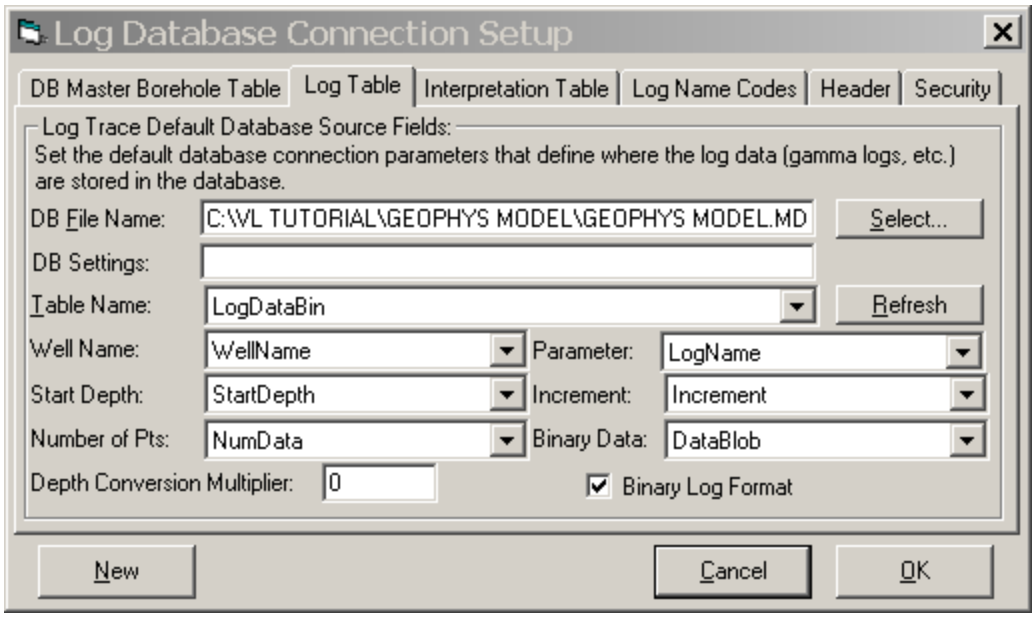
Included in this tutorial database are the table structures that will allow this user to convert the ASCCI data in binary blobs. For further information on the format of the binary storage please refer to the VIEWLOG Topic Reference in the Main Help Menu. Although this lesson will cover only the conversion of HDR files to the binary format. VIEWLOG will also convert a multitude of other formats, including ASCCI, LAS etc.

Configuring the Log Database Connections for Binary Upload

TASK: Convert HDR files into the binary file format.

PROCEDURE:

1. Select **File/**New Log file
2. Select **File/*Import*** and click on the **Configure DB** button.
3. The **DB Master borehole Table** tab can be left as is.
4. On the **Log** tab, check on **Binary Log Format** and fill in the fields as shown below.



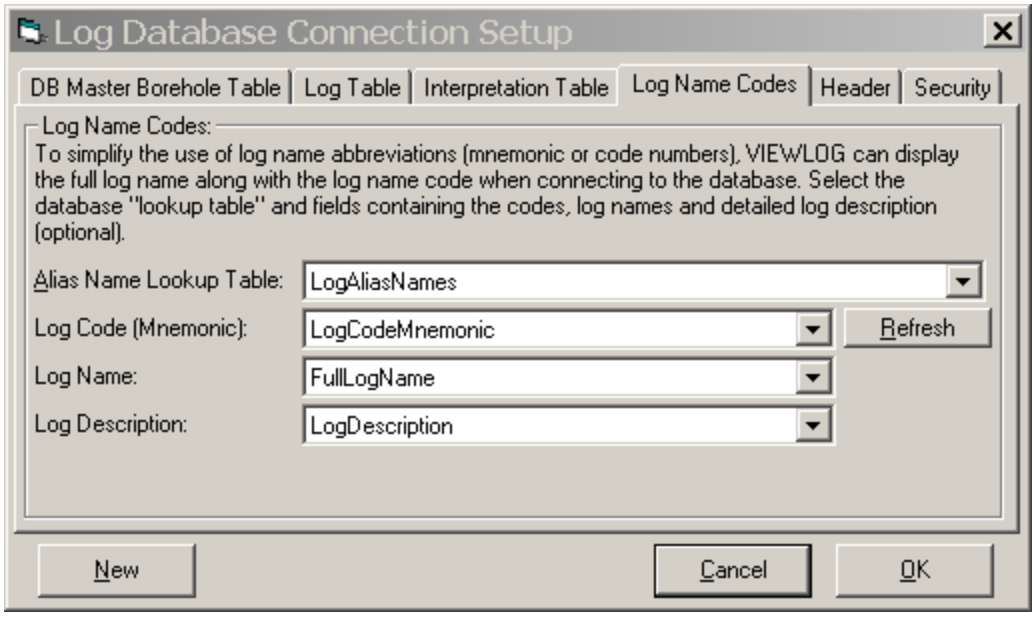
Log tab on the binary configuration menu.

5. On the **Interpretation** tab. Make sure that it is not linked to anything i.e. the fields are blank.

> **Note:** This is to avoid overwriting the work that the student has previously done in this tutorial. However if this were a project which had been started from

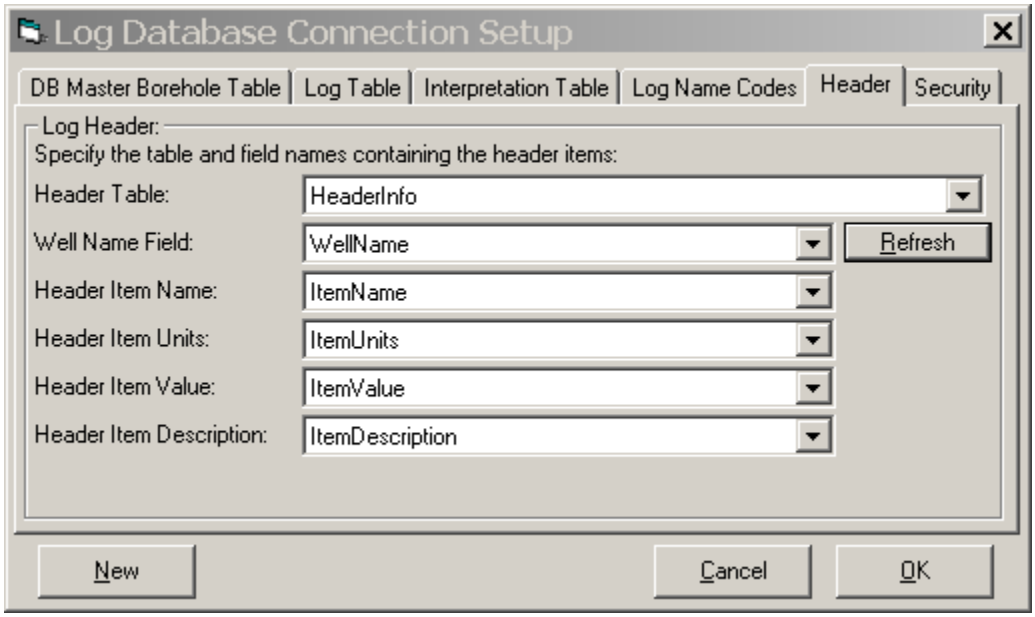
scratch and the interpretations were also being imported for the first time, then the student would want to fill out this table.

6. On the **Log Name Codes** tab, fill in the table as shown below.


Log Database Connection Setup
DB Master Borehole Table
Log Table
Interpretation Table
Log Name Codes
Header
Security
Log Name Codes:
To simplify the use of log name abbreviations (mnemonic or code numbers), VIEWLOG can display the full log name along with the log name code when connecting to the database. Select the database "lookup table" and fields containing the codes, log names and detailed log description (optional).
Alias Name Lookup Table:
LogAliasNames
Log Code (Mnemonic):
LogCodeMnemonic
Refresh
Log Name:
FullLogName
Log Description:
LogDescription
New
Cancel
OK

Log Name Codes tab on the binary configuration menu.

7. On the **Header** tab, fill in the table as shown below.



Header tab on the binary configuration menu.

8. Select **OK**.

9. Now on the **Log Data Import: File Selection Menu**, Select 0.VIEWLOG Version 5.0 and click on the **Select File** button. Select the HDR files from c:\VL tutorial\Geophys Model\Geophys HDR Files. Select all the files.

10. In the Import to HDR File(s), uncheck **Merge Selected Files**.

11. In the Upload to External Database, Check off **Append Well Names to Master Borehole Table** and **Upload Header Details**. The only thing checked on should be **Upload log data.**

12. Select **Upload**. This procedure will have successfully uploaded the downhole geophysics into a binary blob format table. The student can open the tutorial database in ACCESS in look at the new structure. For a more comprehensive outline on the table structures for binary storage please refer to the VIEWLOG Topic Reference in the main VIEWLOG Help Menu.

VIEWLOG Functions

A complete list of all menu commands in the Map Editor, Log Editor, MODFLOW Module, Multi-Well Cross-Plotting and Autoprediction Modules.

MAP EDITOR COMMANDS

File Menu

New drawing

This function is used to create a new drawing file (MAP extension file). By default, all new drawing files will be created in Page coordinates.

Open drawing file…

This function is used to open an existing drawing file (MAP extension). The **Open File** window will appear, from which the can select the desired MAP file.

Close

This function is used to close the currently open drawing file (MAP extension). If the user has made changes to the file since the last time it was saved, they will be asked if they wish to save the drawing file before closing.

Save

This function saves the current drawing file (MAP extension). If a file name has been specified, the map will be saved under that name. If it is a new drawing file, the user will be prompted to enter a new file name.

Save As…

This function allows the user to save the current drawing file (MAP extension) with a new file name. The user must specify a file name in the **Save MAP File** window.

Logs…

New Log File

The **File/Logs/*New Log File*** menu item can be used to create a new log data file (HDR file) in memory.

Open Log File

The **File/Logs/*Open Log File*** menu item is used to open an existing log data file (HDR extension).

Open Log Database

This function allows for easy viewing of logs with user-defined templates as well as the **Log Database Connection Setup** window (for more information, see Open Log Database: Database Tab).

Project…

VIEWLOG projects are used to manage database connection details, borehole Data Sources and gridded Data Parameter information. One or more MAP drawing files (in plan and/or cross section) can be linked to a project. The Project Manager can be used to manage the VIEWLOG project.

New Project

In the Map Editor, a new project can be created with the **File/Project…/*New Project*** function. A warning message will appear if there is already a project open.

Open

The **File/Project…/*Open*** function can be used to open an existing VIEWLOG project file.

Close

The **File/Project…/*Close*** function can be used to close the existing VIEWLOG project file.

Save

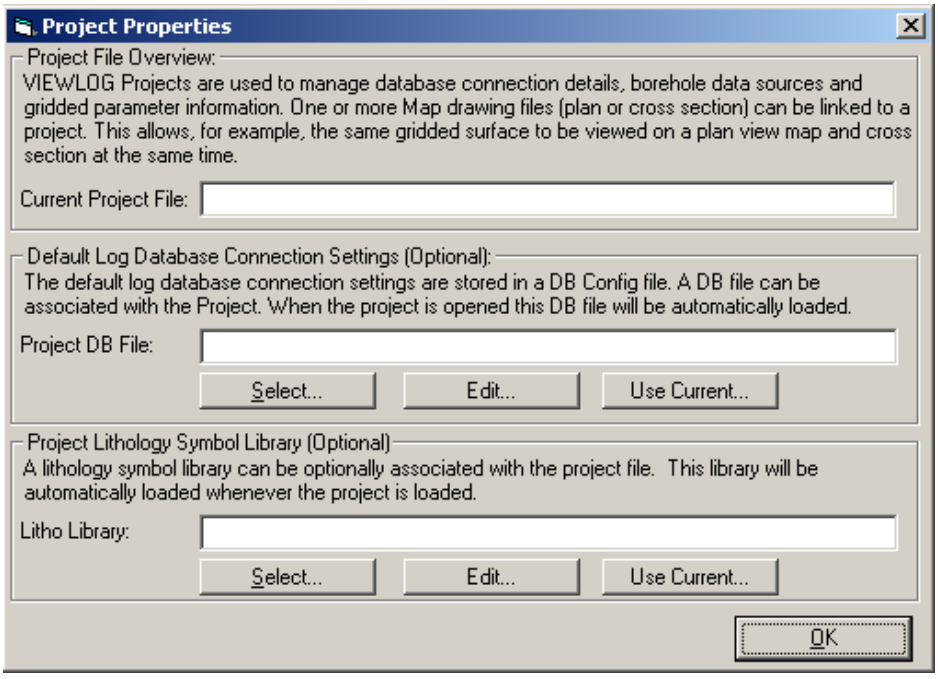
The **File/Project…/*Save*** function can be used to save the existing VIEWLOG project file.

Save As

The **File/Project…/*Save As*** function can be used to save the existing VIEWLOG project file with a new file name.

Project Properties

The **File/Project…/*Project Properties*** function can be used to view and edit the current project file name. Other optional functions that can be set in this window are listed in the following figure. See the Project Data Menu.


Project Properties
Project File Overview:
VIEWLOG Projects are used to manage database connection details, borehole data sources and gridded parameter information. One or more Map drawing files (plan or cross section) can be linked to a project. This allows, for example, the same gridded surface to be viewed on a plan view map and cross section at the same time.
Current Project File:
Default Log Database Connection Settings (Optional):
The default log database connection settings are stored in a DB Config file. A DB file can be associated with the Project. When the project is opened this DB file will be automatically loaded.
Project DB File:
Select...
Edit...
Use Current...
Project Lithology Symbol Library (Optional)
A lithology symbol library can be optionally associated with the project file. This library will be automatically loaded whenever the project is loaded.
Litho Library:
Select...
Edit...
Use Current...
OK

Project Properties.

Move Project

For details on moving projects to new directories, please see Project Manager.

Link MAP to Project

The **File/Project…/*Link MAP to Project*** function can be used to link the current map to a project file. If the map is already linked, a warning window will appear. For more information about VIEWLOG projects, please see Project Manager.

Unlink Map from Project

The **File/Project…/*Unlink MAP to Project*** function can be used to break the link between the current map and the project file. . For more information about VIEWLOG projects, please see Project Manager.

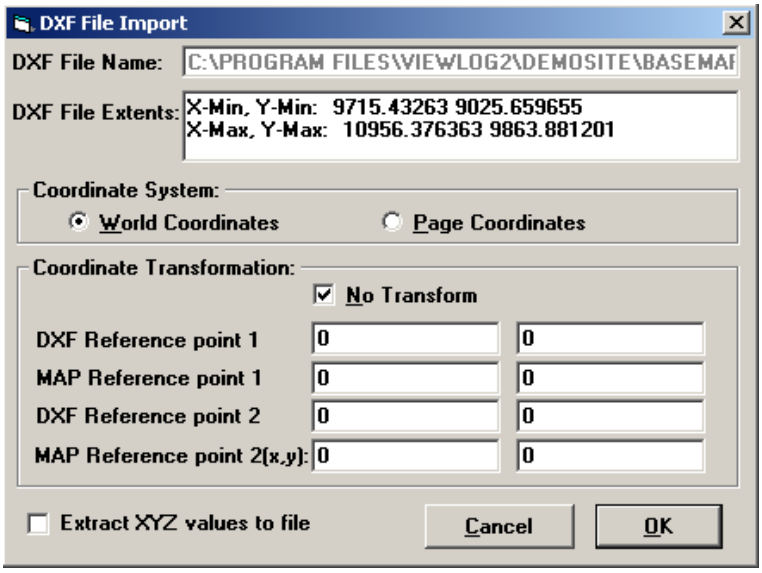
Import/merge

The **File/*Import/merge*** command in the Map Editor is used to import DXF, MAP, MIF or SHP files. The imported data is merged into the current drawing, so if the user wishes to import the file into a new drawing, the user must select **File/**New Drawing. For a step-by-step example of importing files, see the ***Geologic Modelling Tutorial, Lesson 1:*** Importing a File into a Map, and Lesson 2: Mapping and GIS Functions.

Import/merge of DXF File:

1. Select File/*Import/merge*.
2. In the **Import Drawing File** dialog box, browse to the file you wish to import or merge, then select the DXF file.

3. Enter the appropriate parameters in the **DXF File Import** dialog box.



DXF File Import.

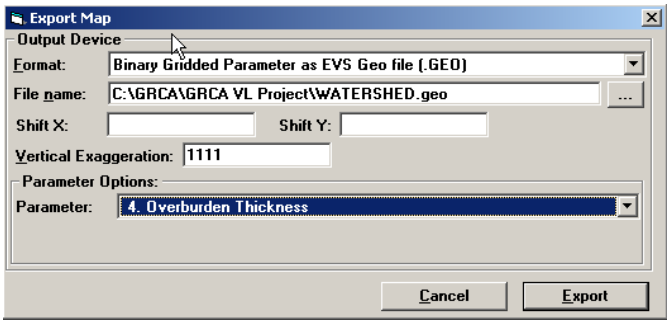
The following options are available:

4. **Coordinate System**: The DXF information can either be converted to Page coordinates or World coordinates. The DXF file extents should indicate the appropriate conversion.
5. **Coordinate Transform**: By specifying the coordinates of two points, in both the original (DXF) and the new (MAP) coordinate system, the DXF file coordinates can be transformed into a new coordinate system.
6. **No Transform**: Check this box to directly convert the coordinates (with no transform).

> **Note:** A similar procedure is used to merge drawing file of other formats (MAP, MIF, SHP) into the current file.

Export

In the Map Editor, the **File/*Export*** menu item, maps can be exported to one of several formats.



Export Map.

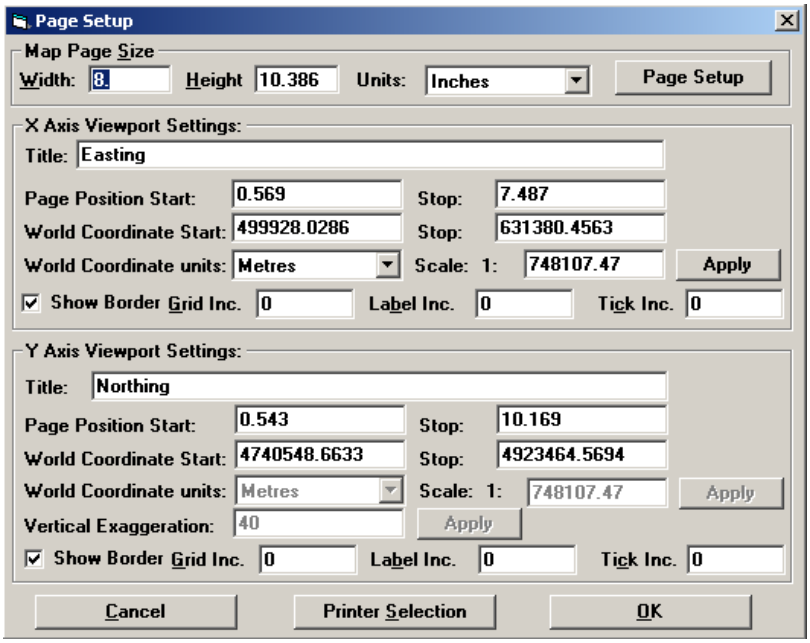
The map can be shifted horizontally (**Shift X**) and vertically (**Shift Y**), and **Vertical Exaggeration** can be specified as well. For the export of gridded maps (items 7 – 11 below), the user must also select which parameter to export.

The available formats for exporting maps include:

1. Windows Enhanced Metafile (.WMF)
2. Windows Metafile (.EMF)
3. JPEG Bitmap (.JPG)
4. Portable Network Graphics Bitmap (.PNG)
5. Tagged Image File Format Bitmap (.TIF)
6. AutoCAD Drawing Exchange File (.DXF)
7. Binary Gridded Parameter as XYZ ASCII file (.XYZ)
8. Binary Gridded Parameter as EVS Geo file (.GEO)
9. Binary Gridded Parameter as Surfer Grid file (.SGR)
10. Binary Gridded Parameter as ArcInfo Grid (.AGR)
11. Binary Gridded Parameter as Modflow 8E14.6 Data file (.DAT)

Page Setup

From the Map Editor, the **Page Setup** window can be accessed from the **File/*Page Setup*** menu. An example of this feature is shown in the ***Geologic Modelling Tutorial, Lesson 2:*** Setting the Page Size.



Page Setup.

The following options are available:

Map Page Size:

Page Width, Height: The width and height of the page.

Units: Page units can be reported in **Inches** of **Centimeters**.

World Coordinate Scaling- X and Y Axis Parameters:

Title: An optional axis title, which, if the **Show Border** check box is selected, is printed along the base of the Viewport (for example, Distance along cross section (m))

Page Position Start, Stop: The start and end positions, in inches or centimeters, of the Page coordinate viewport.

World Coordinate Start, Stop: The start and end positions, in world coordinate units of feet or metres, of the World coordinate viewport.

Show Border: Controls whether a border is drawn around the viewport and the axis title is displayed.

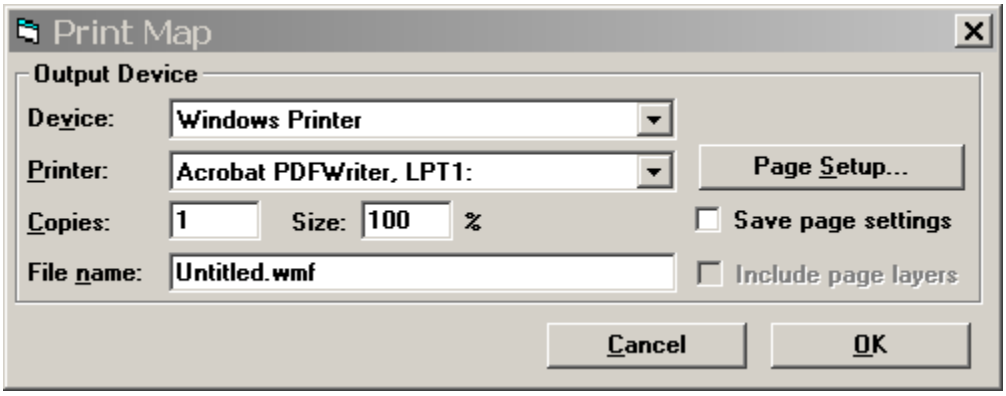
Vertical Exaggeration: Controls the ratio of vertical units to horizontal units.

Grid, Label, and Tick Increment: Enter non-zero values to add scale labels along the viewport edge.

> **Note:** A value of –1 will turn off the grid, label and tick display.

Print

In the Map Editor, the **File/*Print*** menu item loads the **Print Map** window, which is used to create output on paper or export images to another format.



Print Map.

Output Device Options:

Device: Enter the output device or image export file type. Devices include:

Windows Printer: Output to the default windows printer.

Windows Enhanced Metafile (EMF): Output to an Enhanced Windows Metafile.

Windows Metafile (WMF): Output to a MS Windows Metafile.

AutoCAD DXF file: Output to AutoCAD DXF file format. Note that shading does not output to this format.

Printer: Select from a list of installed printers.

Page Setup: Click to enter the printer settings dialog box, from which page size and other aspects of the printer setup are controlled.

Copies: Number of complete copies of the plot generated by the printer.

> **Note:** Some printers cannot automatically generate multiple copies (depending on the printer driver). If the printer cannot generate multiple copies, the **Copies** value will be reset to 1.

Size: Relative size of the plot, in percent.

> **Note:** Some printers cannot automatically scale the plot size (depending on the printer driver). If the printer cannot use this size setting, the **Size** value will be reset to 100%.

File Name: Enter the name of the output file.

Save Page Settings: Check this box to make the settings the default Windows settings. If left unchecked, changes to the **Page Setup** are only saved for the duration of the VIEWLOG session.

Properties

In the Map Editor, the **File/*Properties*** function can be used to display and edit the Map Properties.

Exit

From the Map Editor, the **File/*Exit*** menu item is used to exit VIEWLOG. If changes have been made to the files and they have not been saved, the user will be prompted with an option to save the data.

Edit Menu

Select Objects

The **Edit/*Select Objects*** command (Shortcut: **F2**) in the Map Editor is used to select objects for subsequent processing. For example, to delete objects, the objects must first be selected before using the **Edit/**Delete function to delete the objects. There are several methods available for selecting different objects.

1. **Selecting Polylines**: Clicking the left mouse button while pointing at one of the vertexes of the polyline (including the first and last point on the line).
2. **Selecting Text**: Click on the lower left corner of the text string to select a text object.
3. **Selecting Boxes and WMF Objects**: Click on one of the corners of the object to select it.
4. **Window Select**: Click and drag to define a window. All objects completely within the window will be selected.

5. **Selecting Additional Objects**: Press and hold the **Shift** key to add objects to the currently selected list.
6. **Unselecting Objects**: Simply reselect the object to unselect it. Use with the **Shift** key when working with a group of objects.
7. **Moving Selected Objects**: Hold the **Ctrl** key, click and drag the mouse to define the shift distance.

Advanced Select…

Select All

In the Map Editor, the **Edit/Advanced Select/*Select All*** menu is used to select all objects in the current window.

Select Layer…

In the Map Editor, the **Edit/Advanced Select/*Select Layer*** menu is used to select one or more layers from a list of visible, non-frozen layers. If this option is used, a window will open that lists all current layers that are visible and unfrozen. The user can then select (i.e., check) the desired layer(s). An example of the use of this option can be found in the Geologic Modelling Tutorial – Lesson 2: Editing the Color of Imported Map Objects.

Invert Selection

In the Map Editor, the **Edit/Advanced Select/*Invert Selection*** menu is used to select all objects that are not currently selected, and to unselect those that are currently selected.

Select by attribute…

In the Map Editor, the **Edit/Advanced Select/*Select by Attribute*** menu is used to select all objects that have the same attribute. For example, select all lines that are blue.

Select by Polygon

In the Map Editor, the ***Edit*/Advanced Select/*Select by Polygon*** menu item is used to select all objects that are within, outside, or within a specified distance of a selected polyline.

Allow partial window selection

In the Map Editor, when the ***Edit*/Advanced Select/*Allow partial window selection*** menu item is checked, objects that fall partially within the specified zone will be selected. When unchecked (default), only objects that fall entirely within the zone will be selected.

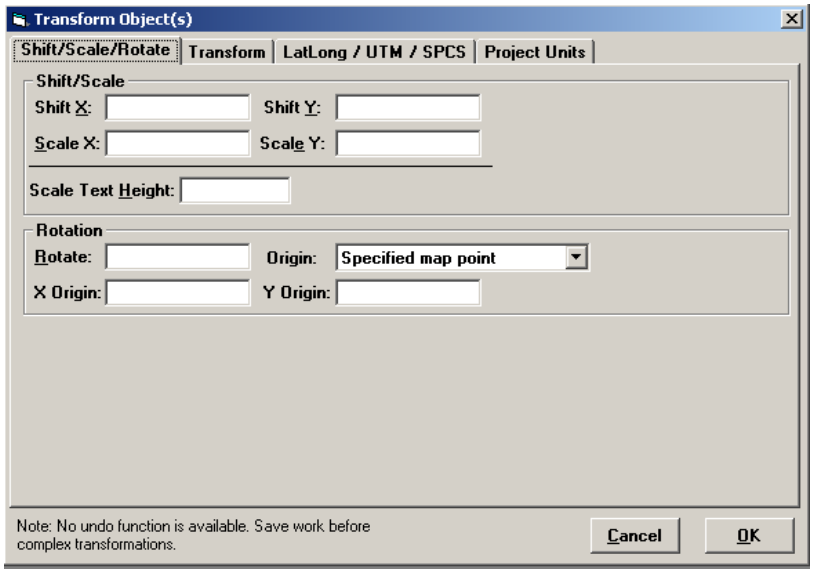
Cancel Current Function

The **Edit/*Cancel current function*** (Shortcut: **F3**) cancels the current mouse function.

Transform

In the Map Editor, the **Edit/*Transform*** function (Shortcut: **Ctrl+M**) is used to transform the selected drawing objects by a specified amount. In the window, four tabs appear.

Transform: Shift/Scale/Rotate Tab



Transform Objects – Shift/Scale/Rotate Tab.

Scaling and shifting objects can also be performed interactively using the **Edit/**Select Objects function. The advantage of the **Transform Object(s)** window is that exact transform values can be entered.

Shift/Scale:

ShiftX, ShiftY: Shift the objects in the X or Y direction.

ScaleX, ScaleY: Reduce (value less than 1) or enlarge (value greater than 1) the selected objects.

> **Note:** Scaling can either be relative or absolute, depending on the **X**, **Y origin** values. To scale relative to an origin other than (0, 0), enter a new origin in the **X** and **Y Origin** boxes.

For example: Consider a box with corners at 100,100, and 200,200. **Scale X**, **ScaleY** entered as 0.5

Case 1: If the X, Y origin is 0., 0. Results of scaling: box corners become 50,50, and 100,100.

Case 2: X, Y origin is 100,100. Results of scaling: box corners become 100,100, and 150,150.

Scale Text Height: If a text object is selected, this can be used to reduce (value less than 1) or enlarge (value greater than 1) the size of the text.

Rotation:

Rotate: Enter the rotation angle in degrees. To rotate relative to an origin other than 0,0, enter a new origin in the **X Origin** and **Y Origin** boxes.

Origin: Select an origin of rotation from the list, which includes:

1. Specified map point
2. Object origin
3. Center of object
4. Origin of selected objects
5. Center of selected objects.

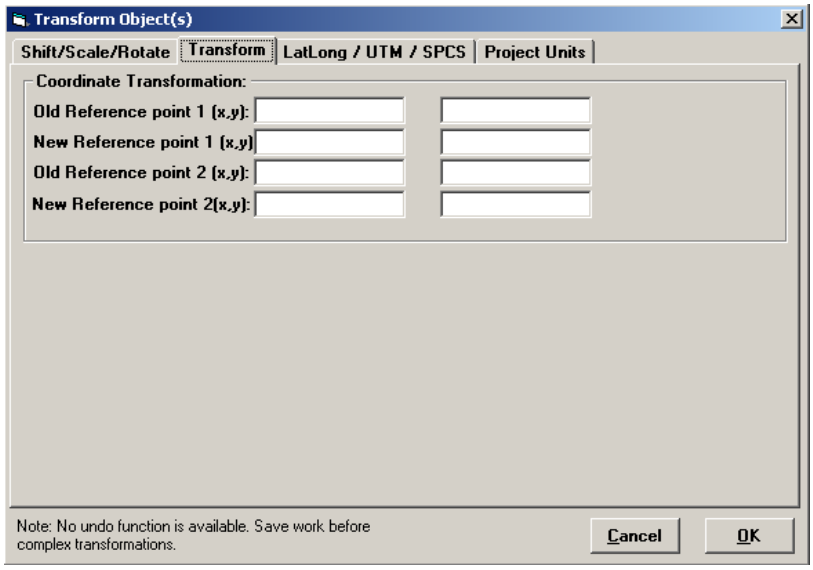
X, Y Origin: The reference point for scaling and rotation.

PROCEDURE:

6. Using the **Edit/**Select Objects function, select one or more drawing objects.
7. Select the **Edit/*Transform*** menu item to display the **Transform Object(s)** dialog box.
8. Enter appropriate transform values in the input boxes. Any values left blank will not be applied.
9. Select **OK** to apply the transform.

Transform: Transform Tab

This function allows the user to transform the coordinates of a map.



Transform Objects – Transform Tab.

Coordinate Transformation:

Old Reference point 1 (x, y): Old x-, y-coordinates of point 1.

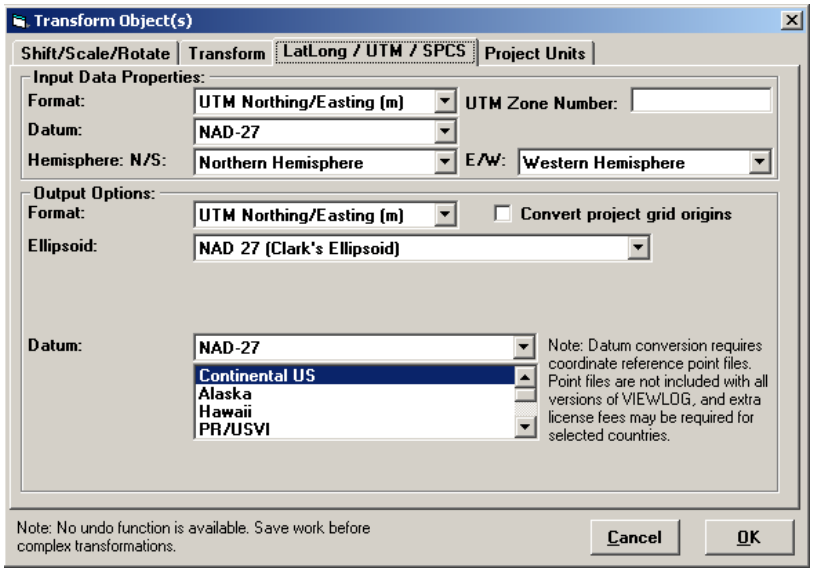
New Reference point 1 (x, y): New x-, y-coordinates of point 1.

Old Reference point 2 (x, y): Old x-, y-coordinates of point 2.

New Reference point 2 (x, y): New x-, y-coordinates of point 2.

Transform: LatLong/UTM/SPCS Tab

This function can be used to convert one coordinate system to another.



Transform Objects – LatLong/UTM/SPCS Tab.

Input Data Properties:

Format: The current units of the selected object(s).

UTM Zone Number: Integer identifier

Datum: Select the datum from the available list.

Hemisphere N/S-E/W: Select N or S and E or W hemispheres.

Output Options:

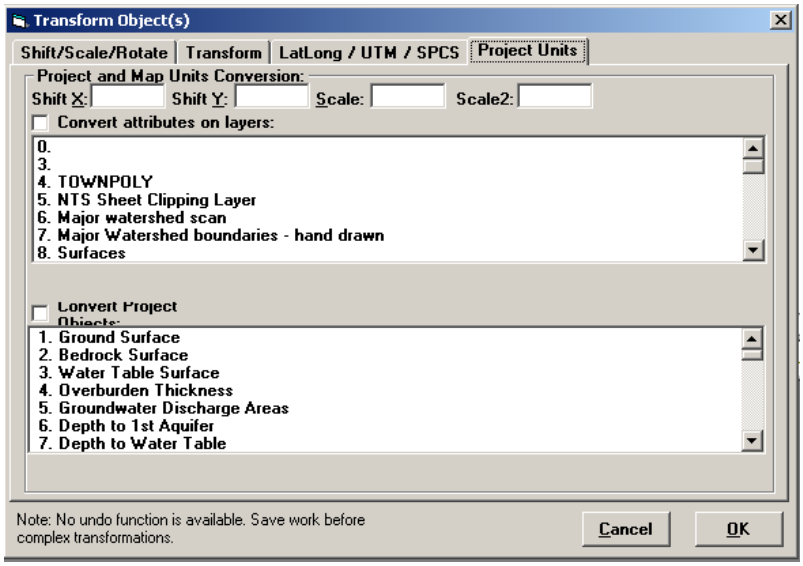
Format: The desired units of the selected object(s).

Convert project grid origins: Check this box to covert grid origins for the project to the new coordinate system.

Ellipsoid: Select the ellipsoid from available list.

Datum: Select the datum.

Transform: Project Units Tab



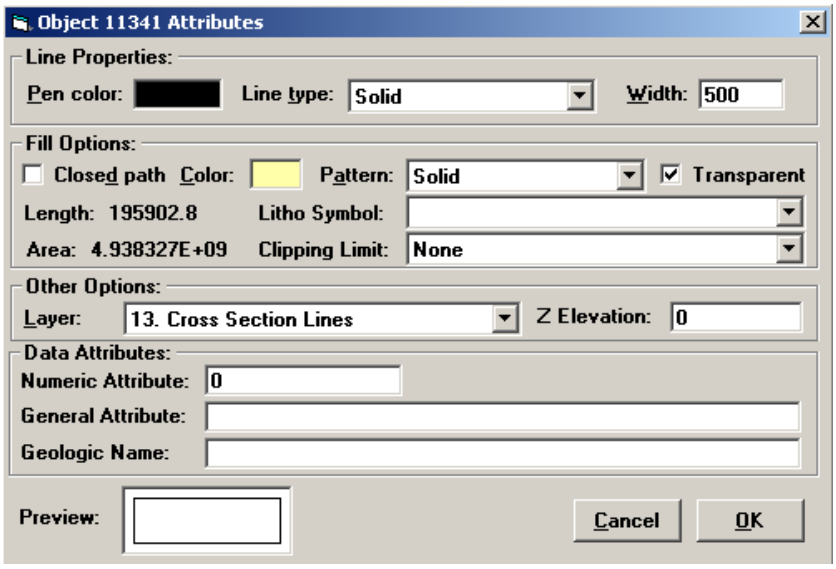
Transform Objects – Project Units Tab.

Object Properties

Selecting the **Edit/*Object Properties*** menu item brings up the **Properties** window for the selected item, including map layer, line properties, polygon fill, image, position and data attributes. Properties of the selected item can be changed using this function. Most object properties overlap with the Line attributes function described in the next section.

Line attributes

In the Map Editor, lines can be edited with the **Edit/*Line Attributes*** function (Shortcut: **Ctrl+A**). All drawing objects have attributes such as color and line thickness. To change the attributes of a polyline object, first select it using the **Edit/**Select Objects menu item, then select **Edit/*Line Attributes*** to display the **Attributes** dialog box.



Line Attributes.

Line Properties:

Pen color: The color of the polyline (outline).

Line type: The type of line (dotted, etc.). Note that MS Windows does not support line types other than solid lines when the width is greater than 0.

Width: The width of the polyline, in drawing units. Enter 0 for no specified thickness.

Fill Options:

Closed path: To create a filled polygon place a check in the **Closed Path** check box, select a **Fill Pattern** such as solid, and choose a fill color by clicking on the box to the right of fill **Color**.

Fill color: The color used to fill the polyline.

Fill Pattern: The pattern, including a solid color, used to fill the polyline.

Litho Symbol: Select a lithology symbol to fill the polyline/polygon.

Clipping Limit: The selected polyline can be clipped to pre-defined extents, such as a ground surface layer.

Other Options:

Layer: Choose the layer on which the current polyline will appear.

Z Elevation: Assign a vertical elevation to the current polyline.

Data Attributes:

Numeric Attribute: This allows the user to assign an integer identifier to a line object.

General Attribute: This allows the user to assign a name to a line object.

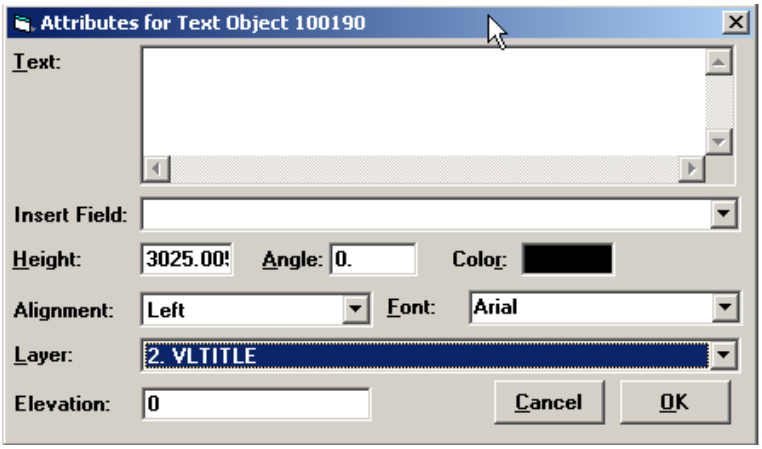
Geologic Name: This allows the user to assign a geologic name to a line object (e.g., “Top of Sand”).

> **Note:** To Change the attributes of a group of objects: When multiple objects are selected and the **Edit/*Line Attributes*** menu item is chosen, all objects will

receive the attribute changes. Note that when multiple objects are selected, the fields in the **Attribute** dialog box are initially blank. Only those attributes whose dialog box values are changed will receive the new values.

Text attributes

The **Edit/*Text Attributes*** dialog box (Shortcut: **Ctrl+E)** is used edit Map Editor text objects.



Text Attributes.

Insert Field: This allows the user to add automatically generated text fields to a map. Text fields are text objects that are updated automatically as the figure changes. (For example, the user can enter a text field for vertical exaggeration on a cross section. If the user changes the value of vertical exaggeration in the figure, the displayed value of vertical exaggeration in the text object will change automatically.) An example of the use of Insert Fields is show in the Geologic Modelling Tutorial – Lesson 2: Creating Map Text Fields and Automatic Titles and Legends. The user can select from the following list of Insert Fields:

1. Legends (for Data Sources or Data Parameters)
2. Map Scales/Scale Bars
3. Map Units
4. Vertical Exaggeration
5. Active Map Name/Number
6. Map View Name
7. Data Parameter Name/Contour Information
8. Data Source Name
9. Visible Data Sources/Data Parameters
10. Visible Grids
11. Current Date/Time
12. Section Offset Distance/Shift Distance

Height: The height of the text, in drawing units.

Angle: The angle of the text, in degrees.

Color: The color of the text.

Alignment: Either left or right justified, or centered.

Font: The text font.

Layer: The drawing layer on which the object will be placed.

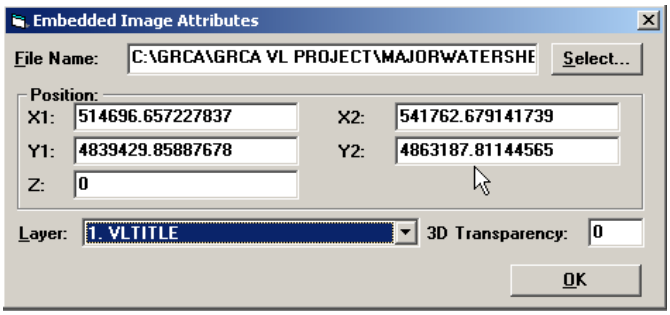
Elevation: Assign a vertical elevation to the current text object or objects, for purposes of viewing text in cross-section.

> **Note:** If one object is selected when the dialog box is loaded, the properties for that object are displayed, including the text string. If more than one text object is selected, the text string option will not be available.

> **Note:** To change the attributes of a group of objects: When multiple objects are selected and the **Edit/*Text attributes*** menu item is chosen, changes will be made to all selected objects. When multiple objects are selected, the fields in the dialog box are initially blank. Only those attributes whose dialog box values are changed will receive the new values. This allows the user to, for example, change the angle of a number of objects to a common value, yet preserve their other unique attribute settings.

Embedded Image attributes

When an image has been placed in the Map Editor (with the **Draw/**Place Image function), the attributes of the image can be modified with the **Edit/*Embedded Image Attributes*** function. The first step is to select the image in the Map Editor. Once an image is selected and this function is chosen, the following window will appear.



Embedded Image Attributes.

Filename: Displays the path and file name of the image. This can be changed by typing in a new file name, or clicking on **Select…** and browsing to a new file.

Position

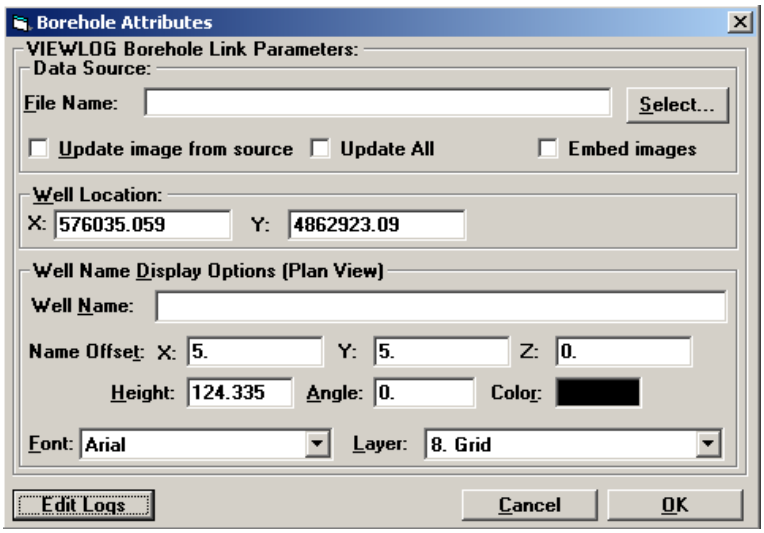
Position: The user can shift the image in the X-, Y- and Z-directions.

Layer: The user can select the layer in which the image will appear.

3D Transparency: The user can select a percentage of transparency for the embedded image in 3D view.

Borehole attributes

With VIEWLOG LT/LS, the **Edit/*Borehole Attributes*** function in the Map Editor (Shortcut: **Ctrl+B**) can be used to display information on a specific borehole. The **Edit/*Borehole Attributes*** function controls the linkage between a VIEWLOG HDR file and a plan map or cross section, as shown below.



Borehole Attributes.

Data Source:

File Name: The name of an existing VIEWLOG header file. Click the **Select…** button to select a file name.

Update image from source: Check this box to regenerate the borehole image on a cross section.

Update All: Check to update all borehole images on a section.

Embed images:

Well Location:

Well Location: The X and Y location of the well.

Well Name Display Options (Plan View)

Well Name: The name of the well as it appears on the plan view map.

Name Offset: The offset, from the true well location, at which the log name will appear.

Height, Angle, Color, Font: The height, angle, text color and font for the well name.

Layer: The layer on which the well will appear.

> **Note:** You can use the Layer menu functions to control what boreholes appear on sections generated from a plan view map.

Edit Logs: Click to load the VIEWLOG header file.

Link Polylines

In the Map Editor, the **Edit/*Link Polylines*** function is used to link two polylines together.

PROCEDURE:

1. Select the end point of the first polyline (Select the end which will be joined, and note that the attributes of the first polyline will be preserved).
2. Select the appropriate end of the second polyline.
3. The line will be redrawn as a single polyline.

Break Polyline

The Map Editor **Edit/*Break Polyline*** function allows the user to break a polyline into two separate lines. Once the line is selected, two separate polyline objects will be created by clicking on the desired break point.

Edit Polyline Nodes

The **Edit/*Edit Polyline Nodes*** function (Shortcut: **Ctrl+N**) in the Map Editor is used to modify an existing polyline. Nodes (or vertex points) can be moved, added and removed with this function.

Once this function is selected, the following options are available:

Selecting a polyline for editing: Point at a vertex point (node) on the polyline to select it for editing. Small boxes will appear at each node when a polyline is selected.

Moving a node: Click within the node box and drag the mouse to move a node to a new position. Note that filled polylines are only re-filled when the **F9** key is pressed.

Adding a node: Press and hold the **Shift** key, then click at a point on the polyline to add a node.

Deleting nodes: To delete one or more nodes, press and hold the **Ctrl** key, then click and drag the mouse to define a window. All nodes within the window will be deleted.

Polyline node functions

Remove duplicate polyline nodes

In the Map Editor, the user can select the **Edit/Polyline node functions/*Remove duplicate polyline nodes*** function to remove duplicate nodes along the selected polyline.

Reduce polyline node count

In the Map Editor, the **Edit/Polyline node functions/*Reduce polyline node count*** function can be used to resample and remove polyline nodes along the selected polyline. The user will be prompted for the minimum cumulative distance between polyline nodes.

Increase polyline node count

In the Map Editor, the **Edit/Polyline node functions/*Increase polyline node count*** function can be used to resample and add polyline nodes to the selected polyline. This option improves the appearance of polylines that are draped on a surface. The user is prompted for the maximum distance between each polyline node.

Reverse polyline node order

As a polyline is drawn, each successive mouse click adds a new node to the polyline. These nodes are numbered in the order in which they are drawn.

Export XYZ from polyline

In the Map Editor, the **Edit/Polyline node functions/*Export XYZ from polyline*** function can be used to export the XYZ coordinates of the selected polyline to a data file (with a *.xyz extension).

Convert to 3D Polyline

Convert to simple objects

Cut

In the Map Editor, the **Edit/*Cut*** command (Shortcut: **Ctrl+X**) is used to copy and delete selected objects (i.e., drawing objects, logs, etc.) to the VIEWLOG clipboard. Note that these objects will not appear on the Windows clipboard because they are incompatible with other programs. Objects on the VIEWLOG clipboard can only be pasted onto other VIEWLOG forms. For example, you can use the **Cut** command to move a log from one file to another.

Copy

In the Map Editor, the **Edit/*Copy*** command (Shortcut: **Ctrl+C**) is used to copy selected objects (i.e., drawing objects, logs, etc.) to the VIEWLOG clipboard. Note that these objects will not appear on the Windows clipboard because the format is incompatible with other programs. Objects on the VIEWLOG clipboard can be pasted onto other VIEWLOG forms. For example, you can use the **Copy** command to copy a log from one file to another.

Paste

The **Edit/*Paste*** function (Shortcut: **Ctrl+V**) is used to insert objects from the clipboard.

Delete

The **Edit/*Delete*** function (Shortcut: **Delete**) deletes all objects that are currently selected. When selected, the user will be asked if they are certain they wish to delete the selected objects.

Copy EMF to Clipboard

The **Edit/*Copy EMF to Clipboard*** function can be used in the Map Editor to copy an image to the Windows clipboard. The image can then be pasted into popular word processors or other software packages for reports or presentations.

> **Note:** Images can only be copied to the clipboard if the user draws a box in **Page View** first.

Copy WMF to Clipboard

The **Edit/*Copy BMP to Clipboard*** function can be used in the Map Editor to copy an image to the Windows clipboard. The image can then be pasted into popular word processors or other software packages for reports or presentations.

> **Note:** Images can only be copied to the clipboard if the user draws a box in **Page View** first.

Copy BMP to Clipboard

The **Edit/*Copy WMF to Clipboard*** function can be used in the Map Editor to copy an image to the Windows clipboard. The image can then be pasted into popular word processors or other software packages for reports or presentations.

> **Note:** Images can only be copied to the clipboard if the user draws a box in **Page View** first.

View Menu

Page View

In the Map Editor, **View/*Page View*** option is used to switch between Page coordinates (inches or centimeters) and World coordinates (metres or feet). With **Page View** enabled (checked), the Map Editor displays a physical page, as it will appear on the printer, with units of inches, for example. Areas outside of the page size are gray. When the Map Editor is in Page coordinates, objects that are drawn in World coordinates cannot be selected or edited.

With **Page View** unchecked, the Map Editor displays coordinates in world units. World coordinates are used for drawing the site map and cross section information. Survey information (e.g., UTM coordinates), borehole locations, road maps, and stream networks are examples of items that would be added in World coordinates.

> **Note:** Page coordinates can be activated with the icon; World coordinates can be activated with the icon.

Map Scale Setup

In the Map Editor, the **View/*Map Scale Setup*** dialog box is used to define page size of the current map. For more information, see Page Setup.

Set Viewport

In the Map Editor, the **View/*Set Viewport*** function is used to control the presentation of objects, scaled in real world coordinates, on an output page. For an interactive example for setting Viewports, see the ***Geologic Modelling Tutorial, Lesson 2,*** Defining the Viewport.

The exact extents of the viewports can be specified in the Page Setup dialog box.

PROCEDURE:

Selecting the Page coordinate viewport: The page coordinate viewport is a box, located at any position on the printer page, in which the real-world information will appear. To select this box, perform the following:

1. Ensure that the **View/**Page View menu item is checked.
2. Select **View/*Set Viewport***. The current viewport extents will be displayed as a dotted line.
3. Press the left mouse button while pointing at the upper left corner of the desired viewport, and then drag the mouse to define the window extents. (Alternatively, click and drag the mouse to define an entirely new viewport.)

Selecting the World coordinate viewport: The world coordinate viewport is the portion of the map that will be displayed in the page viewport. Portions of the real world map outside of the world coordinate viewport will not be displayed. To select this box, perform the following:

1. Ensure that the **View/**Page View menu item is **unchecked**.
2. Select **View/*Set Viewport***. The current viewport extents will be displayed as a dotted line.
3. Press the left mouse button while pointing at the upper left corner of the desired viewport, and then drag the mouse to define the window extents. (Alternatively, click and drag the mouse to define an entirely new viewport.)

Auto Set Viewports

VIEWLOG has three options that can be used to automatically set the Viewports. See Set Viewport to set Viewports manually.

World Viewport

When in World coordinates, this option will set the size of the World Viewport to be current size of the viewing window.

Page Viewport

When in Page View, this option will set size of the Page Viewport to fit on the page. If the dimensions of the page change, this option can be used to reset the Page Viewport.

Both Viewports

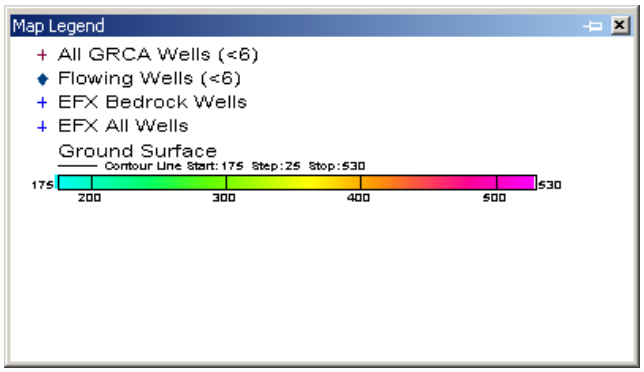
This function can be used to automatically set both the Page and World Viewports based on the size of the drawing page and the size of the World View window.

Map View Menu

Selecting **View/*Map View Menu*** brings up the **Map Views** menu, which shows a list of saved Map Views. If there are no previously saved Map Views, nothing will be listed on this menu. Double-clicking on a Map View in the menu opens the saved Map View in the Map Editor. For an interactive example for setting Viewports, see the ***Geologic Modelling Tutorial, Lesson 2,*** Creating a Map View.

Map Legend

In the Map Editor, the **View/*Map Legend*** menu item is used to show a legend for the current map. A new window that shows the legend will appear along the right side of the VIEWLOG window. An example is shown here:

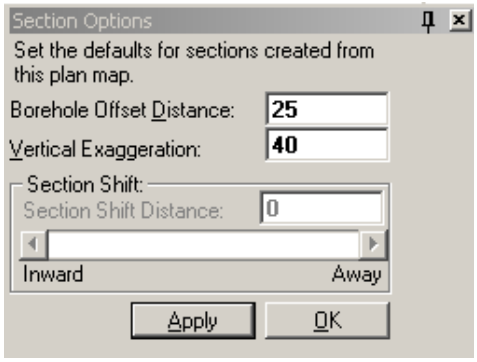


Map Legend.

> **Note:** To add an automatic legend to a map (cross section or plan view), see Insert Fields in the Text attributes menu.

Cross Section Setup

In the Map Editor, the **View/*Cross Section Setup*** dialog box includes the following options:



Cross-Section Options.

Borehole Offset Distance: The offset distance is the perpendicular distance from the cross section within which boreholes will be projected.

Vertical Exaggeration: The vertical exaggeration of the section.

Section Shift:

Once in cross-section view, this can be used to shift the location of the cross section in one direction or the opposite. This function can be useful when the user wishes to interpret the geology in 3-D and needs to make "picks" along different sections throughout the 3-D domain.

> **Note:** In plan view, both options are enabled, and control the appearance of the next cross section generated. In cross section, only the **Vertical Exaggeration** option is enabled, and can be used to change the vertical exaggeration of the current cross section.

For a step-by-step example of how to set up a cross section, see the ***Geologic Modelling Tutorial, Lesson 5,*** Creating a Cross Section.

Create Cross Section

In the Map Editor, the **View/*Create Cross Section*** function can be used to generate cross sections along any polyline in the domain. The first step is to draw a new polyline (**Draw/**New Polyline) along which the cross section is to be drawn. Once a polyline is drawn, this option is selected to draw the section. A new map file will open with the new cross section. For a step-by-step example of how to set up a cross section, see the ***Geologic Modelling Tutorial, Lesson 5,*** Creating a Cross Section.

3-D Setup

This function allows the user to control which surface they wish to view in 3-D. The user can also select the background colour, vertical exaggeration, and the angle and direction of lighting. For more details, see Create 3-D View.

Create 3-D View

This function allows the user to view what is displayed in the Map Editor in 3-D. When this menu item is selected, a new window opens showing the 3-D display with a menu bar providing controls for the 3-D View.

Options

3-D Setup:

3D Options:

Drape Surface

Each line in the basemap has an elevation attribute associated with it. If this attribute has been used, those lines will appear in 3-D at the defined elevations. For lines whose elevation attribute has not been set, by default, these lines will display at an elevation of 0 in 3-D. Because this often to work with, the user can define one of the surfaces (parameters) in their project as the surface for which those lines are draped. Most commonly, this is the ground surface.

Drape Offset

In some cases, the user may wish to offset the lines that are draped on the surface with the surface itself. Imagine the surface you are showing is a solid fill of the ground surface. If there were no offset, then the lines (e.g., roads, lakes etc) and the surface would try to appear in the same space at the same time. This could result in various display issues. The optimum drape offset will depend on each individual project and is affected by such factors as the size of the basemap, angle of viewing, and variation in elevations.

Background Color

Sets the background colour behind the model.

Vertical Exaggeration

This can be used to exaggerate the model in the z direction. It is the same ideas as is used on cross sections. The user can drape a surface over the 3-D image and offset it. The background color and vertical exaggeration can be changed here.

Sun Lighting:

Lighting

Place a check in the lighting check box to turn lighting on. In most cases, light provides an excellent visual cue to perceive changes in elevation and distance. Note that light does require extra processing time and may not be practical to have on at all times in large models. In these cases, only turn lighting on just before producing output.

Azimuth

Azimuth describes a circle around your model in the x, y plane.

Inclination

Inclination describes the angle above or below that plane.

Front Clipping Plane:

Distance and Slide bar

While looking at the model, the view of lower objects and surfaces may be blocked by objects that are higher up. The clipping plane can be used to strip away those upper surfaces. Clipping pushes a plane perpendicular to the user's point of view into the model. As the user drags the slide bar, any objects between the viewpoint and the clipping plane disappear. The clipping plane is invisible and its starting distance is set by the distance input by the user.

Control Keys: When selected, the **3D GeoExplorer Controls** window opens. This shows the user how to control movement in the 3-D View with the keyboard. Choosing one of the four modes, rotate, translate, fly, or normal, will change the function of the other keys.

Copy to Clipboard: (Shortcut: **Ctrl+C**) Copies the 3D image to the windows clipboard.

Save BMP File: Saves the image as a bitmap.

Close: Closes the window.

Path

Playback from Beginning: (Shortcut: **F2**) Plays back any movements the image has made since opening the image in 3D view or clearing the recorded path.

Stop Playback/Continue Playback/Pause Playback: (Shortcuts **F2**, **F3**, **F4**, respectively) Stop, continue, and pause playback.

Reverse: (Shortcut: **F6**). Plays back the recorded path from the last step to the first step.

Fast Mode: (Shortcut: **F7**). Plays back the recorded path faster than the regular speed.

Loop Playback: (Shortcut: **F8**). Once loop playback is selected, the recorded path will play over again once it reaches the end, until the user stops it.

Clear Recorded Path: Clears the recorded path.

Load Path File: Loads a saved recorded path from file.

Save Path File: Saves the recorded path.

Save Playback Images: Saves the recorded path as an AVI file.

Update

If any changes to the 3D view have been made, selecting this menu option updates the 3D view to reflect the changes.

Help

Selecting this menu option brings up the **Control Keys** menu.

Zoom In

In the Map Editor, the **View/*Zoom In*** function (Shortcut: **F4**) is used to enlarge the display of information on screen.

Procedure:

4. Click and hold the left button at the upper left corner of the desired zoom window.
5. Draw with the mouse to define the extents of the window. While dragging, a box will appear on the screen showing the region that will become the new screen window.
6. Once the mouse button is released, the screen will redraw using the parameters defined by the box.

Zoom Out

In the Map Editor, the **View/*Zoom Out*** menu item (Shortcut: **F5**) increases the amount of information displayed on screen.

Zoom All

In the Map Editor, the **View/*Zoom All*** menu item (Shortcut: **F6**) sets the screen scaling parameters to include all objects displayed on screen.

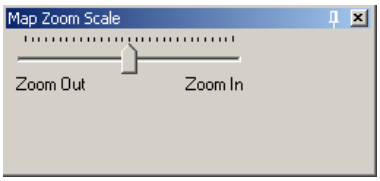
Zoom Last

In the Map Editor, *the* **View/*Zoom Last*** menu item (Shortcut: **F7**) sets the screen scaling parameters to those last used.

Zoom…

Zoom Scale Menu

In the Map Editor, the **View/Zoom…/*Zoom Scale Menu*** function will open an interactive window that will allow the user to control the zoom of the map with a dial.



Map Zoom Scale.

Zoom Map Extents

In the Map Editor, the **View/Zoom…/*Zoom Map Extents*** function is used to zoom to the full extent of the map coordinates.

Zoom Selection Extents

In the Map Editor, the **View/Zoom…/*Zoom Selection Extents*** function allows the user to define their own zoom window. If this function is selected, the user must use the mouse and the left-click-drag control to define a rectangular zone for zooming.

Zoom Viewport

In the Map Editor, the **View/Zoom…/*Zoom Viewport*** function is used to set the screen display bounds to the viewport extents. If Page View is enabled, the **Zoom Viewport** option sets the window to the page coordinate viewport extents. If Page View is disabled (i.e., the Map Editor is in World coordinates), the extents are set to the world coordinate viewport.

Pan

The **View/*Pan*** menu function (shortcut: **F8**) is used to shift the drawing image to view a different portion of the image. Pressing and holding the left button and then dragging the mouse either up or down the screen will shift the screen window. A line will appear while the mouse button is held down to indicate the pan movement and distance.

Update

The **View/*Update*** command (Shortcut: **F9**) redraws the screen to refresh the image display.

Draw Menu

New Polyline

In the Map Editor, the **Draw/*New Polyline*** function (Shortcut: **Ctrl+P**) creates a new polyline. A polyline can consist of two or more nodes (vertex points). For a list of polyline attributes, see Line Attributes. For step-by-step instructions on drawing polylines, see the ***Geologic Modelling Tutorial - Lesson 1:*** Drawing Polylines in the Map Editor.

Text

The **Draw/*Text*** function in the Map Editor (Shortcut: **Ctrl+T**) is used to add text to a drawing. For step-by-step instructions on drawing polylines, see the ***Geologic Modelling Tutorial - Lesson 1:*** Adding Text in the Map Editor.

Procedure:

1. Select the **Draw/*Text*** menu item.
2. Click at the desired text location, and then enter the text in the Text attributes dialog box.
3. Ensure that the text **Height**, **Font** and other attributes are suitable, then select **OK**.

> **Note:** To define the text angle interactively when adding text, select the **Draw/*Text*** menu item, and then click and drag the mouse to define the text orientation.

Box

In the Map Editor, the **Draw/*Box*** function is used to create a box on the drawing page. The box has the same attributes as a polyline. To add a box, select the **Draw/*Box*** function, then click and hold the left button while dragging the mouse to define the box.

Place Image

The **Draw/*Place Image*** command in the Map Editor can be used to insert a graphics file. For a step-by-step example of how place an image in a map file, see the ***Geologic Modelling Tutorial, Lesson 1,*** Linking Images.

Place OLE Object

This option allows the user to insert linked graphic or OLE object into a VIEWLOG map. When selected, an Insert Object window will appear, and the user can select the file type from the menu.

Color scale bar

In the Map Editor, the **Draw/*Color scale bar*** function can be used to construct a rectangular color scale bar in the drawing window. When this function is selected, the user must use the mouse to define a rectangle inside which the color scale bar will appear.

> **Note:** A better method of drawing a color bar is to use the **Insert Field** option in the **Draw/*Text*** function in the Map Editor (see Text attributes).

Add Borehole

The **Draw/*Add Borehole*** menu is used to manually place a borehole on a Map Editor map.

Procedure:

1. Make sure **View/**Page View is unchecked to switch into World coordinates. If necessary, define a World coordinate viewport using the **File/**Page Setup***.***
2. Select **Draw/*Add Borehole.***
3. Click the left mouse button at the approximate location of the borehole.

Fill in the **Borehole Attributes** in the window that appears. These include the **File Name** that contains the Data Source, the **Well Location** and **Well Name** and display options for the well.

Snap

In the Map Editor, the **Draw/*Snap*** command is used to round the drawing coordinates. For example, enter a **Snap** of 0.25 to produce coordinates that are always rounded to the nearest 0.25 division.

Current Layer

In the Map Editor, the **Draw/*Current Layer*** function will load the Layer menu, where the current layer can be selected. New drawing objects are placed on the current layer.

Arrange

To Front

The Map Editor **Draw/Arrange/*To Front*** function is used to move the selected drawing objects to the end of the drawing sequence. For example, use the **To Front** function to move a text string in front of all objects on that layer.

To Back

The Map Editor **Draw/Arrange/*To Back*** function is used to move the selected drawing objects to the first position in the drawing sequence.

Forward One

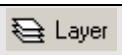
The Map Editor **Draw/Arrange/*Forward One*** function is used to move the selected drawing objects one position forward in the drawing sequence. For example, use the **Forward One** function to move a text string in front of a closed polyline.

Back One

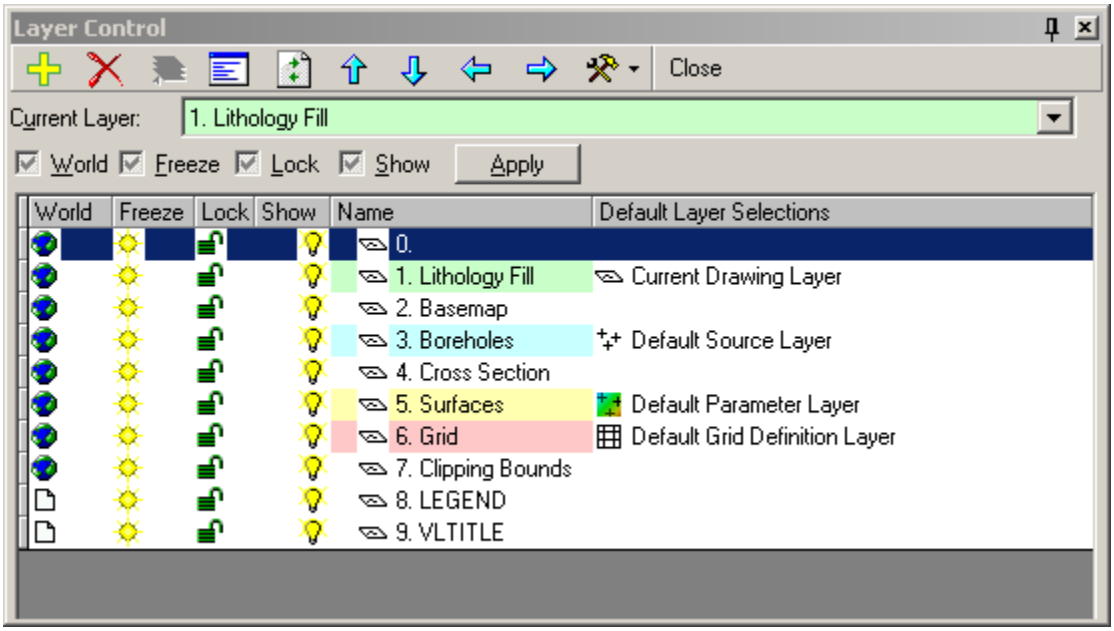
The Map Editor **Draw/Arrange/*Back One*** function is used to move the selected drawing objects one position backward in the sequence. For example, use the **Back One** function to move a closed polygon behind a text string.

Layer Menu

The **Layer** menu item in the Map Editor will open the **Layer Control** window, which allows multiple layers to be defined within a drawing, in a similar manner to CAD programs such as AutoCAD. Layers provide a powerful method to group and manage drawing objects. A list of icons in the Layer Control window is provided below.

Note: The **Layer Control** window can also be activated with the 

icon.



Layer Control.

Add New Layer: Add a new layer to the list under the current highlighted layer.

Delete Layer: Delete the highlighted (selected) layer.

Set as Current Layer: Set the selected drawing layer as the current (active) layer in the map.

Layer properties: See Layer Properties below.

Refresh Screen Image: Update the screen image.

Move layer up a level: Move a layer up in the layer ranking.

Move a layer down a level: Move a layer down in the layer ranking.

Demote layer class level: In some cases it will become necessary to group similar layers together; demoting or promoting the layers will create a directory tree structure to group the layers.

Promote layer class level: In some cases it will become necessary to group similar layers together, demoting or promoting the layers will create a directory tree structure to group the layers.

Tools:

Rename layer: Allows the user to specify a new name for a layer.

Select objects on layer(s): Selects all objects within a single layer.

Set Default Data Source layer: By setting this option the Data Source menu will default to the appointed layer. See Data Source.

Set default Parameter layer: By setting this option the Data Parameter menu will default to the appointed layer. See Data Parameter.

Set default Grid Definition layer: By setting this option the Grid definitions will default to the appointed layer. See Grid Properties, and Define New Grid.

Close: Closes the **Layer** menu.

World/Page: Sets the layer to World coordinate system or to Page coordinates.

Freeze/Thaw: The frozen state allows the user to see the layer, but does not allow editing. For an example of this option, see the ***Geologic Modelling Tutorial, Lesson 3,*** Showing and Freezing Layers.

Lock/Unlock: The lock state allows the user to see the layer, but does not allow editing.

Show/Hide: Displays or hides the selected layer(s).

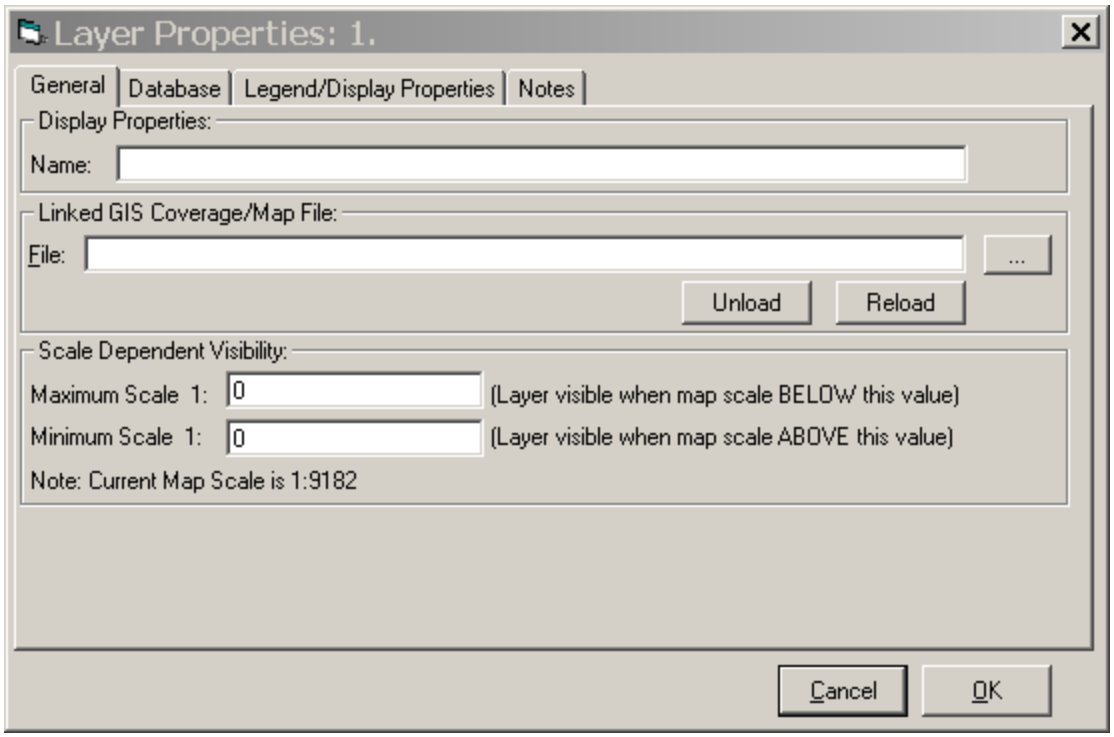
Name: Name of the layer.

Default Layer Selections: Displays the default layer selections

Layer Properties

Layer Properties: General Tab

In this tab, a layer can be linked to a shape file. For a step-by-step example of how to perform this task, see the ***Geologic Modelling Tutorial, Lesson 2,*** Linking to Shape Files.



Layer Properties – General Tab.

Display Properties:

Name: Name of layer property to be displayed.

Linked GIS Coverage/Map File:

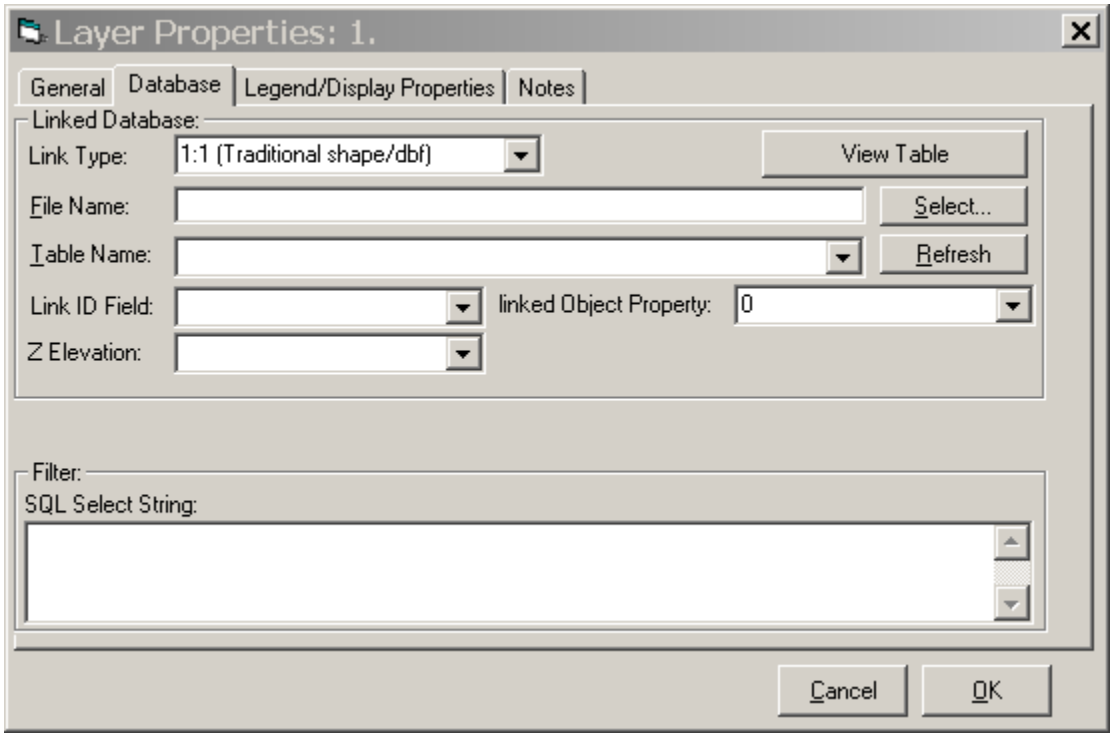
File: Select the GIS file to be linked. Select **Unload**/**Reload** to refresh.

Scaled Dependent Visibility

Maximum Scale 1: The layer is visible only when the map scale is below the assigned value.

Minimum Scale 1: The layer is visible only when the map scale is above the assigned value.

Layer Properties: Database Tab



Layer Properties – Database Tab.

Linked Database:

Link Type: Choose from 1:1, 1:many, or many:1 database relationships.

File Name: Select the filename of the database to be linked by pressing the **Select…** button.

Table Name: Select the table within the selected database to be linked.

Link ID Filed: Choose the field within the table that provides the ID for the linked information.

Z Elevation: Choose the field that provides the elevation for the linked information.

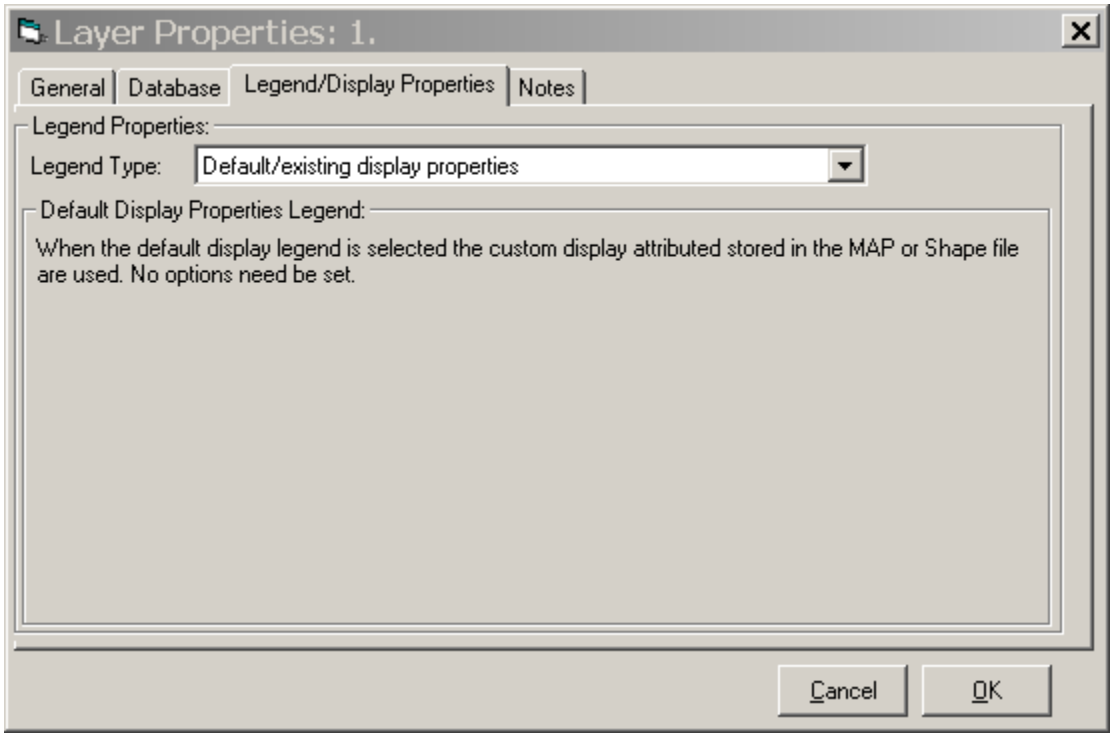
Linked Object Property: Choose a field containing an additional property of the object.

View Table: Opens a window showing the data from the selected table.

Filter:

Under construction.

Layer Properties: Legend/Display Properties Tab:



Layer Properties – Legend/Display Properties Tab.

Legend Properties:

Legend Type: Select from four predefined legend types.

Default/existing display properties: Object attributes are stored in the map or shape file; no options need be set.

Uniform display properties: Display options (line properties and fill options) are set here and all objects in the linked file are displayed using these settings.

Gradient colour value display:

Unique display classes:

Default Display Properties Legend:

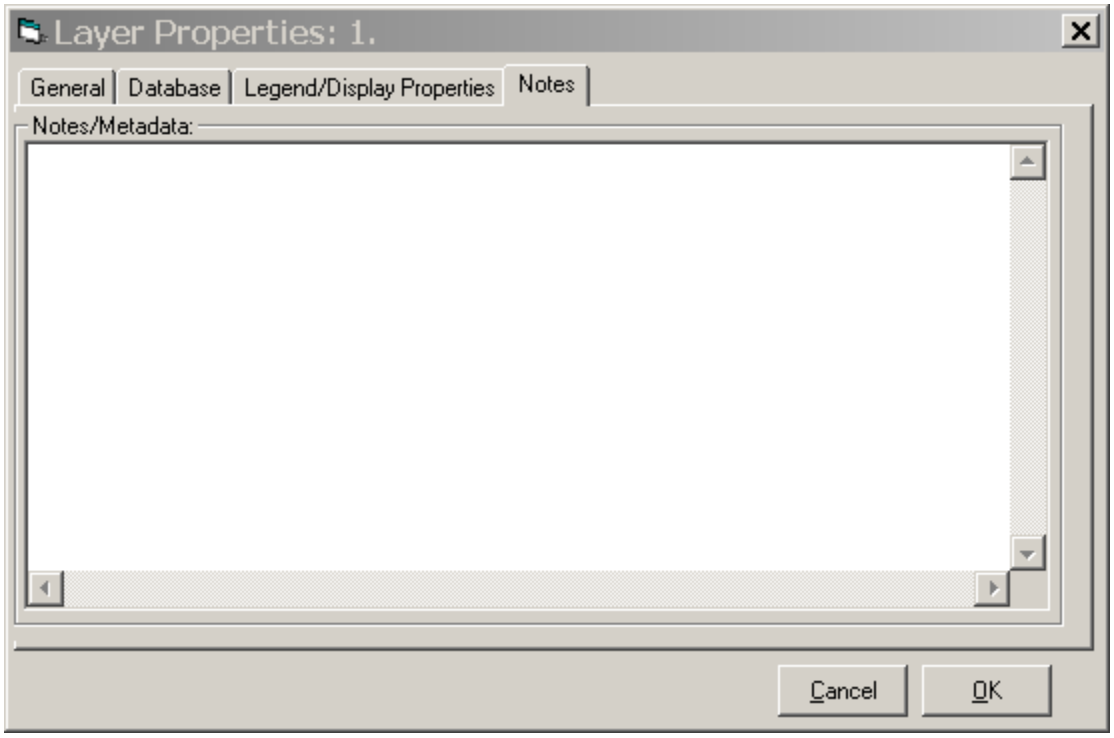
When the default display legend is selected the custom display attribute stored in the MAP or Shape files are used. No options need to be set.

Uniform Display Properties Legend:

Line Properties: Select pen colour, line type, and width of line; all object in the linked file are displayed with these settings.

Fill Options: Select closed path, colour, pattern, transparency, and litho symbol; all objects in the linked file are displayed with these settings.

Layer Properties: Notes Tab



Layer Properties – Notes Tab.

Notes/Metadata

Comments on layer properties and other metadata can be added in this window for future reference.

Tools Menu

Find

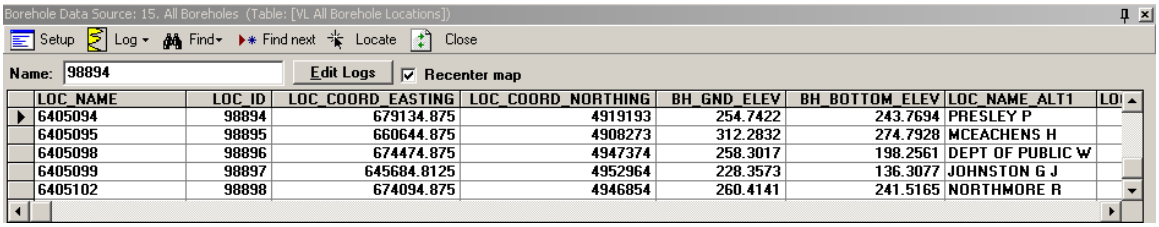
In the Map Editor, the **Tools/*Find*** function (Shortcut: **Ctrl+F**) can be selected search the database for a specific text string.

The Find Window.

Database Browser

In the Map Editor, the **Tools/*Database Browser*** command can be used to view the database from within VIEWLOG (versions DB or higher). When selected, VIEWLOG will open a new window, which includes the borehole data. The database can then be edited within VIEWLOG. Changes made in this **Database Browser** window will be made directly to the database.

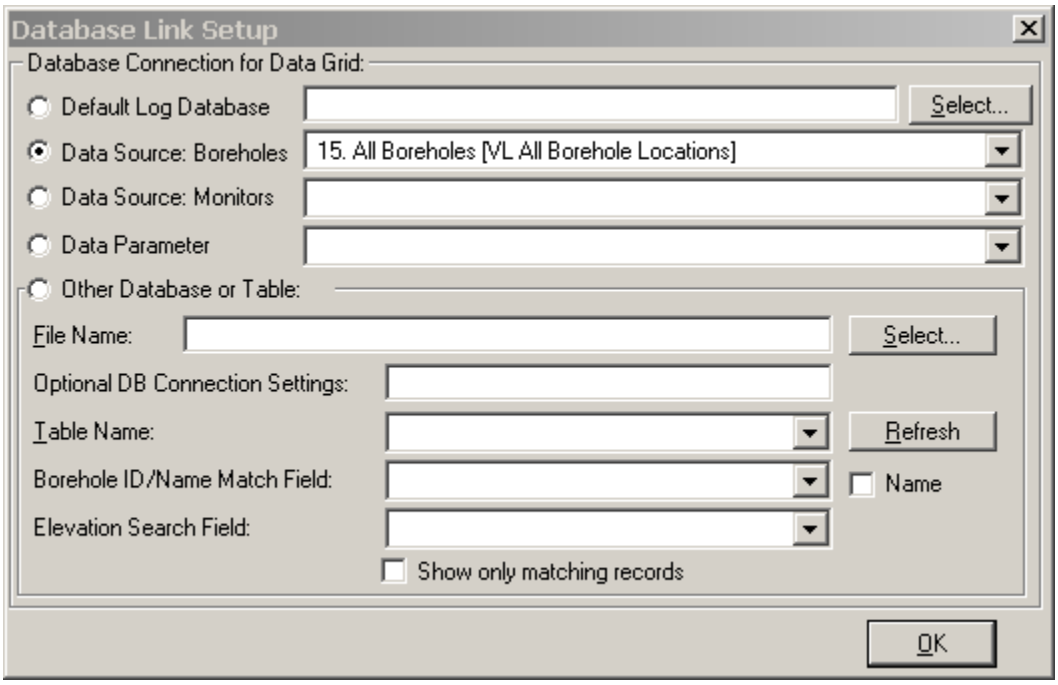
> **Note:** New queries cannot be created with this function. The user can also use this feature to link to sources in the database and view data or pick out boreholes. This function allows the user to switch between queries or tables from within VIEWLOG, without the need for opening MS-ACCESS.



LOC_NAME	LOC_ID	LOC_COORD_EASTING	LOC_COORD_NORTHING	BH_GND_ELEV	BH_BOTTOM_ELEV	LOC_NAME_ALT1	LOI
6405094	98894	679134.875	4919193	254.7422	243.7694	PRESLEY P	
6405095	98895	660644.875	4908273	312.2832	274.7928	MCEACHENS H	
6405098	98896	674474.875	4947374	258.3017	198.2561	DEPT OF PUBLIC W	
6405099	98897	645684.8125	4952964	228.3573	136.3077	JOHNSTON G J	
6405102	98898	674094.875	4946854	260.4141	241.5165	NORTHMORE R	

Borehole Data Source.

Setup: This option opens the **Database Link Setup** window, which controls the data that will be displayed in the **Borehole Data Source** window (shown above).



Database Link Setup.

Database Connection for Data Grid:

The **Borehole Data Source** window can be linked to one of several different database connections, as listed here:

1. Default Log Database
2. **Data Source: Boreholes:** The user can select any existing Data Source that is displaying boreholes.
3. **Data Source: Monitors:** The user can select any existing Data Source that is displaying monitors.
4. **Data Parameter:** The selected Data Parameter must be one that is linked to the database, and posted.
5. **Other Database or Table**: The user can use this option to select any table or query from an existing database.

Log: The Log menu has two options:

Edit Logs: The log that is currently selected will open in the Log Editor for editing.

Print selected log: This will print the currently selected borehole log.

Find: The Find menu has five options:

Enter Find/Filter criteria: This allows the user to enter filter criteria for searching for specific boreholes or groups of boreholes. The user must enter the criterion in the desired field. For example, to search for location names that have “smith” in the name, enter LIKE “smith” in the location name field. Once all criteria are entered, use the **Find!** button to execute the filter.

Sort: The data can be sorted by any of the field names. For example, to sort an Elevation field in ascending order, type **[Elevation] Asc** in the text box. To sort in descending order, use **Desc**. A field can also be sorted by clicking or shift-clicking on the field heading.

Clear criteria: This option is used to clear all criteria that are currently entered in the criteria window.

Clear filter: This option is used to clear current filters.

Cancel find: This will cancel the current find.

Find next: This button is used to find the next borehole that fits the specified criteria.

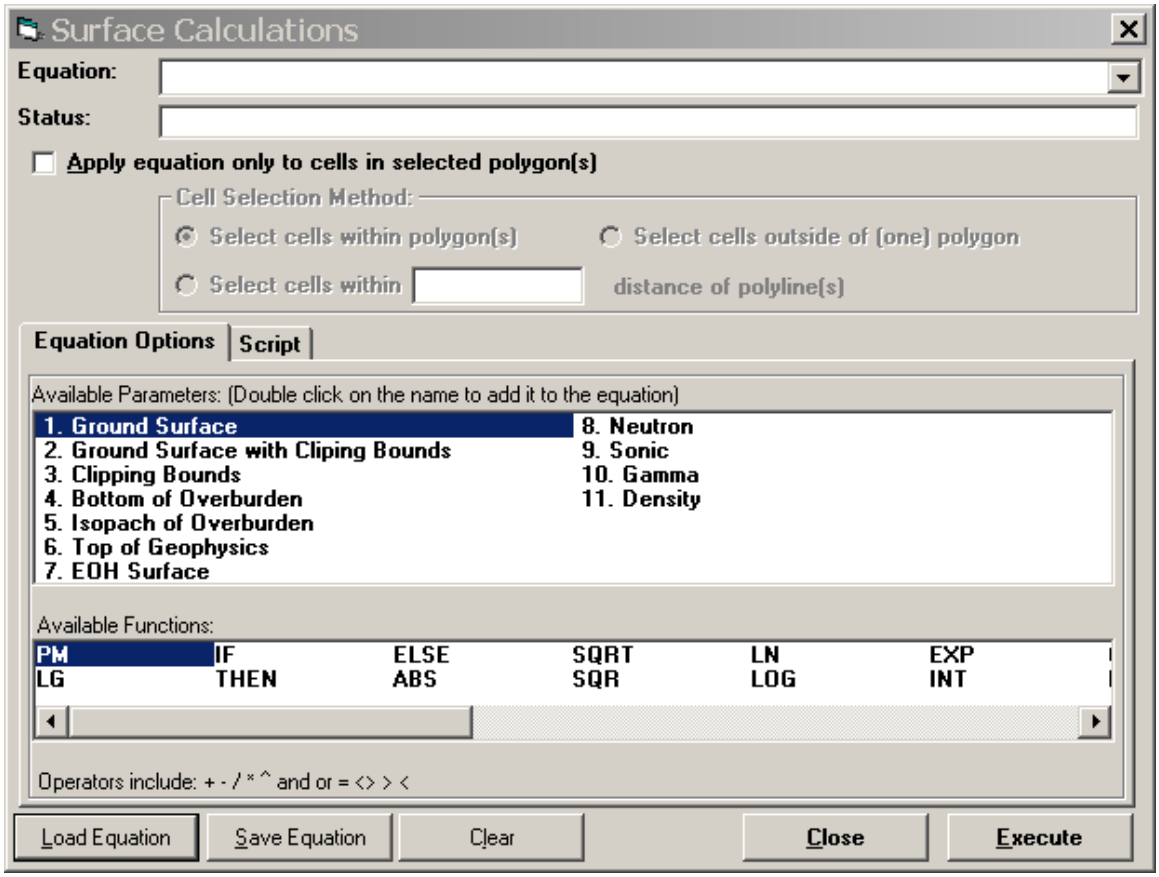
Locate: This option is used to locate the specified borehole on the map.

Close: This option closes the **Borehole Data Source** window.

> **Note:** This window can also be activated by double clicking on a borehole in either a plan-view or cross-section map, or in the Data Source: Boreholes Tab, or by selecting a borehole/right clicking/and selecting Data Attributes.

Parameter Calculator

In the Map Editor, the **Tools/*Parameter Calculator*** function allows the user to write complex equations to create new parameters that are based on previous parameters. For step-by-step instructions on the use of this option, see the ***Geologic Modelling Tutorial – Lesson 6:*** Parameter Calculator for Surface Correction, and Creating an Isopach Map.



Parameter Calculations.

Equation Options Tab:

For example, from the figure shown above, if the user wishes to create a new parameter that is defined by the difference between the ground surface and the bottom of the overburden, they would type in the following equation into the **Equation** line at the top of the window:

PM(5) = PM(1) – PM(4)

Where PM(5) is the new parameter (i.e., Isopach of Overburden), PM(1) is the Ground Surface and PM(3) is the Bottom of Overburden surface. The equation can be applied to the entire map, or to cells within the selected polygons(s). In the **Available Parameters** box, parameters can be double-clicked to be added to the equation.

Available Functions:

A list of **Available Functions** is also shown; these can also be double clicked if the user wishes to add them to the equation. General Operators include: **+**, **-**, **/**, *****, **and**, **or**, **+**, **<**, **>**.

Function	Description
PM	Indicates a parameter. This must be followed by the parameter number in brackets: PM(ParameterNum).
LG	Indicates a Log, Must be followed by the Log Number in brackets:

	LG(LogNum).
IF/THEN/ELSE	Conditional statement that must in used in conjunction with defined parameters. (e.g., PM(4)= IF(PM(3)<1000)THEN (-99999) ELSE(PM(2))), where –99999 is the Null value.
ABS	Returns the Absolute Value of a number, a number without its sign: ABS(number)
SQRT	Returns the Square Root of a number.
SQR	Returns the Square of a number.
LN	Returns the Natural logarithm.
LOG	Returns the Logarithm.
EXP	Returns e raised to the power of a given number.
INT/FIX	Both INT and FIX remove the fractional part of number and return the resulting integer value. The difference between INT and FIX is that if number is negative, INT returns the first negative integer less than or equal to number, whereas FIX returns the first negative integer greater than or equal to number. For example, INT converts -8.4 to -9, and FIX converts -8.4 to -8.
CINT	CINT differs from the FIX and INT functions, which truncate, rather than round, the fractional part of a number. When the fractional part is exactly 0.5, the CINT function always rounds it to the nearest even number. For example, 0.5 rounds to 0, and 1.5 rounds to 2.
SGN	Returns an integer indicating the sign of a number.
DEPTHLOG	DepthLog(1).
CELLAREA	Finds the area of the particular cell in a defined grid: CELLAREA(ParameterNum).
CELLFILL	Finds blank cells and will interpolate to fill in the adjacent cell values within a grid: CELLFILL(ParameterNum).
CELLSLOPE	Generates the slope of a particular cell with a defined grid:CELLSLOPE(ParameterNum).
GRADLOG	GRADLOG(LogNum,DepthOffset).
SIN	Returns the sine of a number.
COS	Returns the Cosine of the given number.
TAN	Returns the Tangent of the given number.
ARCSIN	Returns the Arcsin of a number.
ARCCOS	Returns the Arccos of a number.
ARCTAN	Returns the Arctangent of a number.
RND	Returns an evenly distributed random number.
FACT	Returns the factorial of a number.
SMOOTHGRID	Smooths the grid in the defined Data Parameter using 3x3 averaging of the cell values: SMOOTHGRID(ParameterNum) .

Load Equation: Loads the equation into the **Load Equation** window for future reference.

Save Equation: Saves the equation into the **Save Equation** window for future reference.

Clear: Clears the equation line.

Execute: Executes the equation.

Parameter Calculator: Script Tab

The **Script** tab in the Parameter Calculator can be used to set up multiple parameter equations:

Add Equation to script: Adds an equation to the VIEWLOG Script.

Edit Selected: Edits the selected VIEWLOG Script File.

Clear: Clears the contents of the Script editor.

Load: Loads a previously saved VIEWLOG script file.

Save: Saves the script as a VIEWLOG *.VLS file.

Run Script: Runs the displayed script.

Load Equation: Loads the equation into the **Load Equation** window for future reference.

Save Equation: Saves the equation into the **Save Equation** window for future reference.

Clear: Clears the equation line.

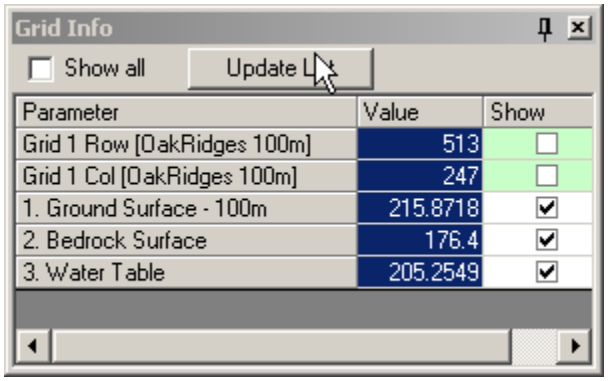
Execute: Executes the script.

Parameter Calculator: Summation Options Tab

The **Summation Options** tab in the Parameter Calculator is used to perform summation calculations for area, volume or total flux. To perform a summation calculation, include the words SUM at the start of the equation.

Parameter Browser

The **Tools*/Parameter Browser*** menu item in the Map Editor allows the user to view the values of different gridded parameters. When selected, a **Grid Info** window will appear on the right side of the VIEWLOG window. By selecting **Show All**, a list of all parameters will appear in the window. When the user left clicks the mouse in the map grid, the **Grid Info** window will be updated with the current row and column location, as well as the parameter value for each parameter. If the **Show All** box is unchecked, only the row and column number will appear. The row and column numbers for the grids that associated with the active Data Parameters will also be shown. The **Update List** button is used to update the list of parameters when different parameters are activated or inactivated.



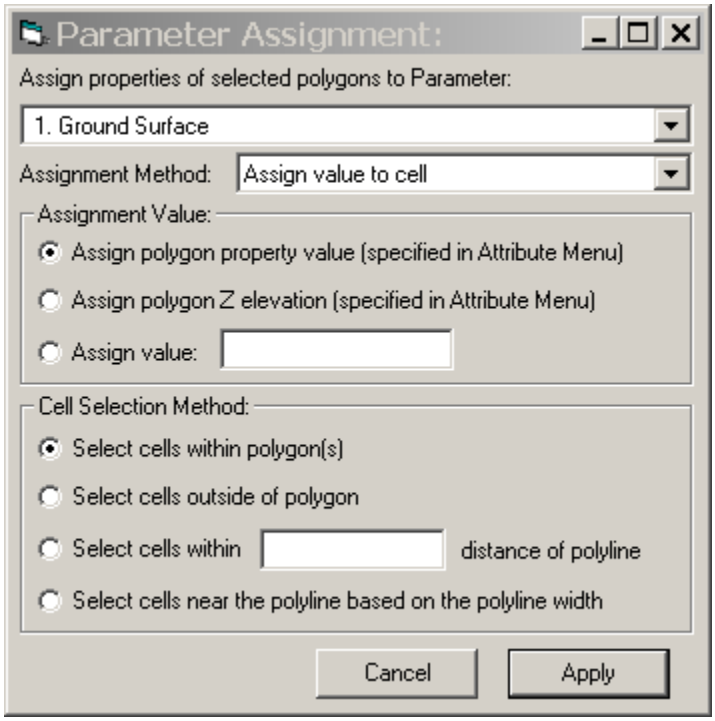
Parameter Browser.

Parameter Editor

The **Tools/*Parameter Editor*** allows the user to change cell values on a cell-by-cell basis. If this is elected, a window will open up with a spreadsheet-like display, with cell values listed in rows and columns. Each individual value can be modified.

Parameter Assignment

In the Map Editor, the **Tools/*Parameter Assignment*** function can be used to assign property values to the whole grid, to inside or outside selected polygons, or to cells within a specified distance from a selected line. An example of the use of this function can be found in ***Geologic Modelling Tutorial – Lesson 6:*** Clipping Gridded Data.


Parameter Assignment:
Assign properties of selected polygons to Parameter:
1. Ground Surface
Assignment Method:
Assign value to cell
Assignment Value:
Assign polygon property value (specified in Attribute Menu)
Assign polygon Z elevation (specified in Attribute Menu)
Assign value:
Cell Selection Method:
Select cells within polygon(s)
Select cells outside of polygon
Select cells within
distance of polyline
Select cells near the polyline based on the polyline width
Cancel
Apply

Parameter Assignment.

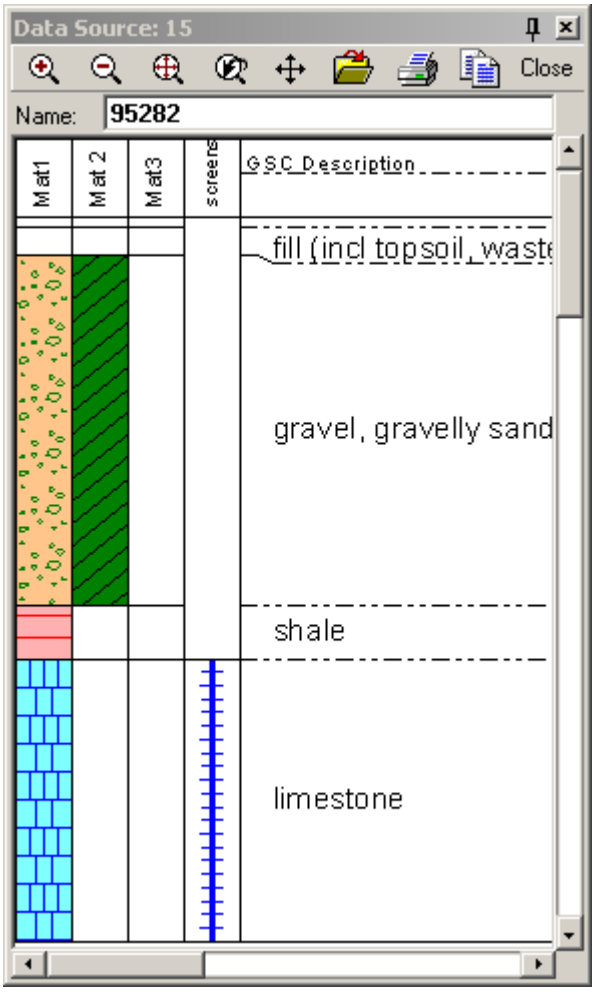
The user must first select the parameter to which the properties will be assigned. Next, the user must choose the **Assignment Method**. There are five different methods of assigning the values to the cells:

1. Assign value to cell
2. Add value to cell value
3. Subtract value from cell value
4. Multiply cell value by property value
5. Divide cell value by property value.

Finally, the user must specify the **Assignment Value** and the **Cell Selection Method** from the lists of choices, as shown in the above figure.

Show Source Browser Window

The **Tools/*Show Source Browser Window*** menu opens a window in which the Alternate Data Source Browser Template HDR File (as defined in the Data Source: Logs Tab) will be displayed when the user clicks on a borehole from the map. This allows the user to view the borehole log of any well in the map.



Source Browser Window.

Show Pick Options Menu

The **Tools/*Show Pick Options*** menu displays the current Data Source and available lithology names to assign to a pick. The available lithology names are linked to the Lithology symbol library. See Lithology Symbol Editor.

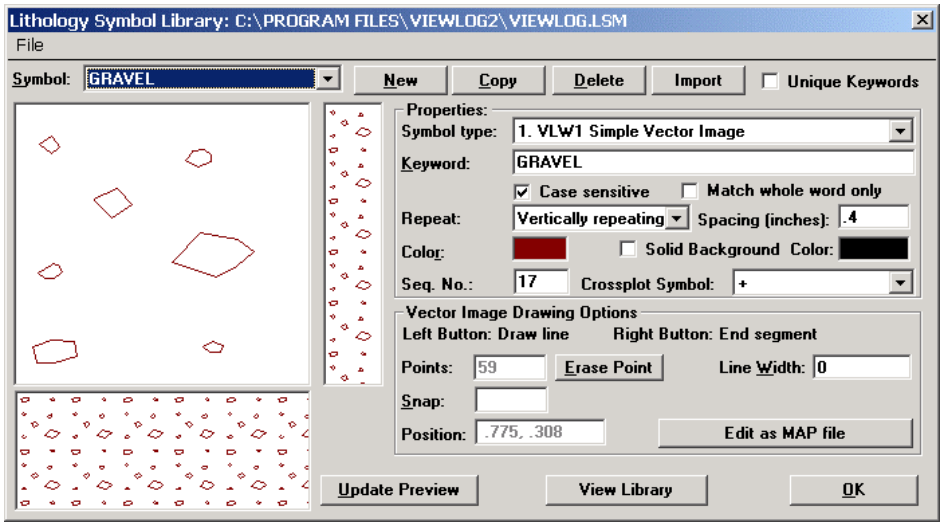
For information on how to use this option please refer to the ***Geological Modelling Tutorial:*** Lesson 8: Advanced Mapping Options.

Pick Geology on Section

When developing a 3-D conceptual geologic model, VIEWLOG has the ability to pick geology where borehole logs do not provide enough detail to define the stratigraphy. This allows the user to use their geologic knowledge and experience to aid in the interpretation of stratigraphic layers and hydrostratigraphy. The **Tools/*Pick Geology on Section*** menu allows the user to select a borehole, then left click to add a contact and right click to remove a contact. For information on how to use this option please refer to the ***Geological Modelling Tutorial:*** Lesson 8: Advanced Mapping Options.

Lithology Symbol Editor

In the **Lithology Symbol Library**, all lithology symbols are made up of line segments drawn within the large reference box on the left side of the screen. The patterns drawn within the box are repeated to fill the lithology column when the lithology name (or key word) is specified in a text message. In addition to the large drawing box on the left, an example of the symbol, drawn at the normal size, is shown in the small column on the right side of the screen.



Lithology Symbol Library.

The steps outlined here provide guidance for modifying the different lithology symbols.

1. Polyline segments are made by pointing within the large box, and pressing the left mouse button. The first press of the left button will define the starting point of the segment, and subsequent clicks define a polyline pattern. To end a sequence of

segment lines (i.e., raise the pen from the paper), press the right mouse button. Additional line segments can be drawn by repeating the drawing process with the left and right mouse buttons.

2. In general, it is best to keep the symbol simple (i.e., fewer line segments), and use a small repeat spacing to create the fill effect. If, however, the symbol is made up of only long vertical lines, large repeat spacings are appropriate.

Symbol type: VIEWLOG supports three types input for lithology symbols:

1. VLW1 Simple Vector Image
2. Image file (VL MAP; EMF; WMF; BMP; RLE; JPG; GIF; TIF; PNG)
3. Windows Fill Pattern.

Keyword: This is the keyword that is used to define the symbol. If, for example, the **Keyword** is set to LIMESTONE, every time this exact name appears in a text description, the corresponding symbol will be drawn in the lithology column. A text description can contain more than one keyword. For example, if the text description is SAND TILL, the symbols for both SAND and TILL will be drawn in the lithology column.

Case sensitive: If this is checked, the match between the keyword and the text description is case sensitive. If unchecked, case does not have to be in agreement between the keyword and the text description.

Match whole word only: If checked, the keyword must match exactly with the specific word in the text description. For example, if the text description is SANDY unit, the keyword SAND will not be recognized if this box is checked. However, if this box is not checked, then a text description that includes SANDY will recognize the SAND keyword.

Repeat: The user can choose if the symbol pattern is repeated vertically, or centered within the specific lithologic unit.

Spacing (inches): This parameter controls the size of the pattern. A larger value will result in a coarser appearance of the lithology symbol, whereas a smaller value will result in finer symbol appearance.

Color: The color of the symbols.

Solid background: If this is checked, the background will be a solid color; if unchecked, no background will be present.

Background Color: This controls the color of the background.

Seq. No.: This controls the sequence of the lithology symbols.

Crossplot Symbol: From a list of symbols, the user can choose which symbol to use for this lithologic unit in cross plot analyses.

For vector images, the following options are available:

Points: This lists the total number of drawing points within the draw window.

Erase Point: This deletes the last operation of the mouse button (either a press of the left or right button). Repeated selection of this option will delete all linked lines.

Line Width: This can be used to control the width of the lines that are drawn in the draw window.

Snap: This parameter is used to restrict the mouse movement to fixed increments. It can be useful when drawing symbols with regular patterns. The snap applies only to the drawing process, and can be turned on or off (set to 0) during drawing. When the snap is set to zero, the

mouse can define a point anywhere in the symbol box. If, for example, the snap is set to 0.1, all defined points are rounded to the nearest 0.1 increment in the x and y direction. It is easier to draw perfect horizontal and vertical lines when the snap value is set to a number, such as 0.05. The snap value can range between 0 and 1.

For image files, the user must browse to the specific file that contains the lithology symbol.

Edit as MAP file: The vector image can be brought directly into a VIEWLOG map file for further editing.

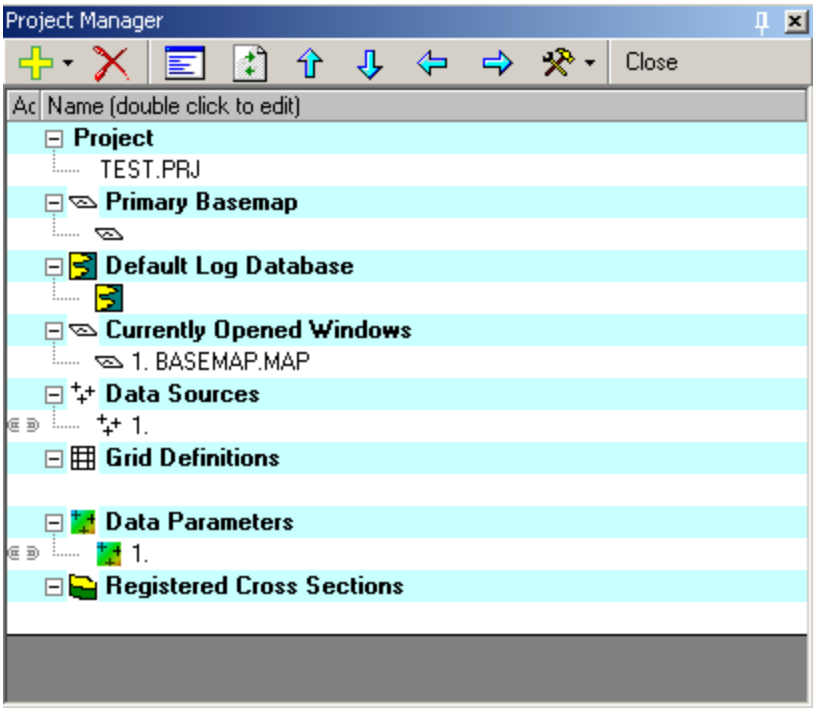
For Windows fill patterns, there are several options available for the Fill Pattern:

1. Horizontal Line
2. Vertical Line
3. Downward Diagonal
4. Upward Diagonal
5. Cross
6. Diagonal Cross
7. Solid

Project Data Menu

Project Manager

When selected, this menu item will open the **Project Manager** window (shown below). More in ***Geological Modelling Tutorial:*** Lesson 4: Working with VIEWLOG Projects.



Project Manager.

Add New Object: Adds a new object as defined below.

Define project base map: Select a base map to link to the project file.

Register cross section(s): Link selected cross-sections to the project file.

Add New Data Source: Adds a new Data Source. This will bring up the Data Source menu.

Add New Data Parameter: Adds a new Data Parameter. This will bring up the Data Parameter menu.

Add New Grid definition: Instructs the user to add grids using the **Project Data/**Define New Grid menu function.

Delete Object: Deletes a selected (highlighted) object.

Project Properties: Displays the corresponding **Properties** menu for the selected item. For example, if a data parameter is selected, the data parameter menu is opened.

Refresh List: Refreshes the list after changes have been made.

Move up list: Moves selected item up in the ranking.

Move down list: Moves selected item down in the ranking.

Demote class Level: In some cases it will become necessary to group similar items together; demoting or promoting the items will create a directory tree structure to group the items. This can also be done by right-clicking on the desired item, and selecting **-> Demote Level**.

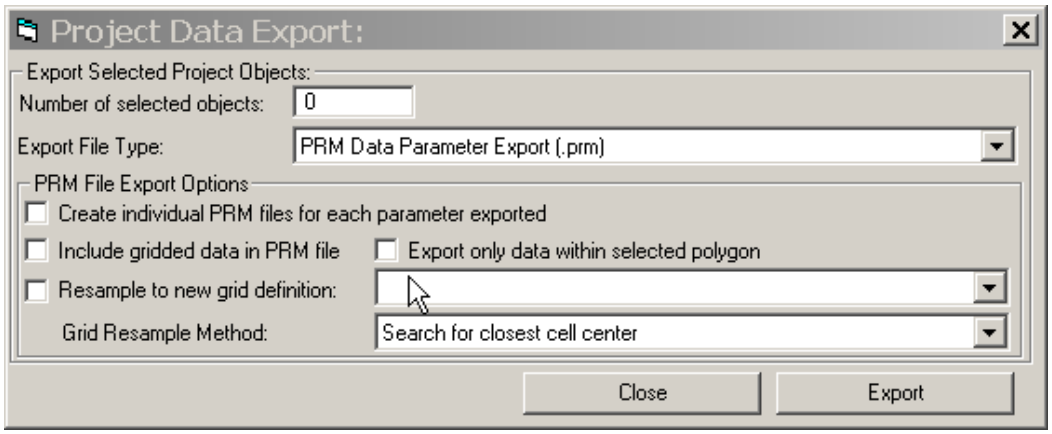
Promote class level: In some cases it will become necessary to group similar items together, demoting or promoting the items will create a directory tree structure to group the items. This can also be done by right-clicking on the desired item, and selecting **-> Promote Level**.

Tools: In the Project Manager window, the Tools menu has the following options:

Import project data:

Export project data: If selected, this option will open the **Project Data Export** window, as shown below. The user must first select which Data Parameters, Data Sources and/or Grids they wish to export. This can be done in the Project Manager window (Use Ctrl-click for multiple selections).

> **Note**: You must export Data Sources, Data Parameters and Grids separately, although, you can, for example, export numerous Data Parameters at the same time.



Project Data Export.

Number of selected objects: This box will show the total number of Data Parameters, Data Sources or Grids that have been selected by the user.

Export File Type: The user can select from PRM (Data Parameter), SRC (Data Source) or GDF (Grid) file types.

PRM File Export Options:

Create individual PRM files for each parameter export: If checked, VIEWLOG will export each Data Parameter into a separate file. If unchecked, all exported Data Parameters will be merged into a single *.prm file.

Include gridded data in PRM file: If checked, each grid file will be included with each exported Data Parameter. If unchecked, the grid files will not be included.

Export only data within selected polygon: If checked, only data within a selected polygon will be included when the Data Parameters are exported. If unchecked, all data will be included.

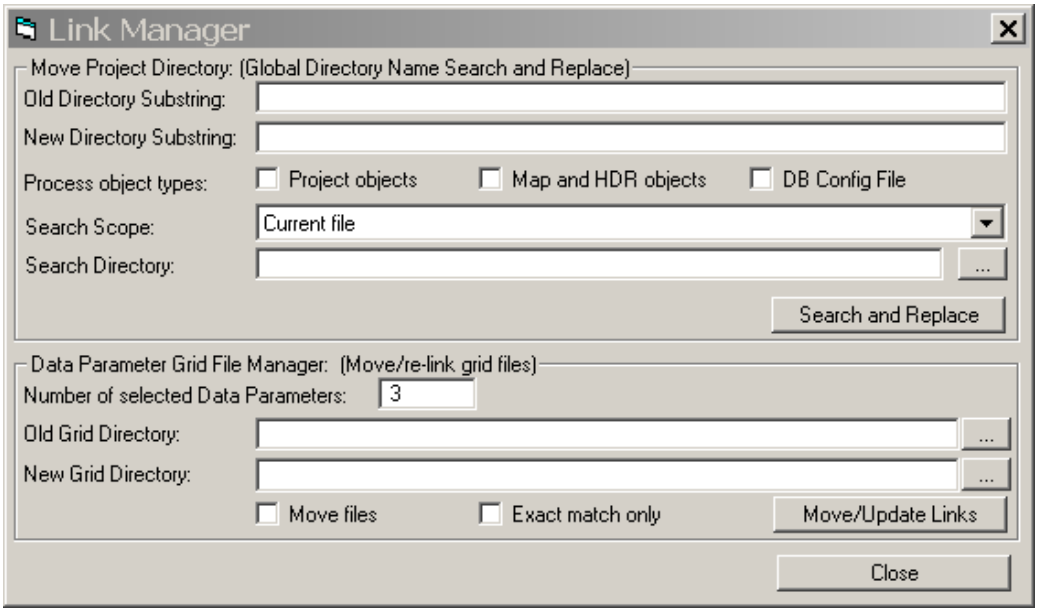
Resample to new grid location: If checked, the selected Data Parameters will be resampled to a new grid location (the user will have to select a VIEWLOG grid from the pull-down menu). If unchecked, the selected Data Parameters will not be resampled to a new grid location.

Grid Resample Method: If the user wants to resample to a new grid, they must select the new grid to which they wish to resample. This can be done using the pull-down menu. The two options for resampling are:

Search for closest cell centre: This option will assign a new cell value based on the closes cell from the old grid.

Average cells within new grid: This option will assign a new cell value based on the average of cells from the old grid that fall within the new cell.

Link Manager: The Link Manager allows the user to move a VIEWLOG project directory to a new location. This procedure must be done in two steps: (1) Move Project Directory, and (2) Move/Re-link Data Parameters (as shown below):



Link Manager.

Move Project Directory: (Global Directory Name Search and Replace)

Old Directory Substring: Specify the entire old directory substring.

New Directory Substring: Specify the entire old directory substring.

Process object types:

Project objects: Check this box to move project objects.

Map and HDR objects: Check this box to move Map and HDR files.

DB Config File: Check this box to move the DB config file.

Search Scope: There are three options in this pull-down menu:

Current file: Searches for files in only the current project directory.

All open files: Searches for all open files that are currently specified within the Project Manager.

All VL files in directory: Searches for all VIEWLOG files that are defined by the Project Manager.

Search Directory: The directory in which to search for project files.

Search and Replace: Use this button to perform the search and replace function.

Data Parameter Grid File Manager: (Move/re-link grid files)

Number of Selected Data Parameters: The user must first select one or more Data Parameters from the Project Manager. Once selected, the number of selected Data Parameters will be shown here.

Old Grid Directory: Specify the old directory that contains the *.grd files.

New Grid Directory: Specify the old directory that contains the *.grd files.

Move files: Check this box to move the *.grd files from the old to the new directory.

Exact match only: Matches the exact directory string.

Move/Update Links: Use this button to move and update the *.grd links.

Resample gridded parameters:

If the user wants to resample to a new grid, they must select the new grid to which they wish to resample.

Number of selected objects: This box will show the total number of Data Parameters that have been selected by the user (Parameters are selected in the Project Manager).

Resample Method:

Change grid definition only (no resample): This option will only change the grid definition; no resampling of the grid is performed.

Search for closest cell centre: This option will assign a new cell value based on the closes cell from the old grid.

Average cells within new grid: This option will assign a new cell value based on the average of cells from the old grid that fall within the new cell.

New Grid Definition: Use the drop-down menu to select from the list of grids in the VIEWLOG project.

Resample Grid(s): Use this button to perform the grid resampling.

Project Properties

Project File Overview

VIEWLOG Projects are used to manage database connection details, borehole Data Sources and gridded Data Parameters information. One or more Map drawing files (plan view or cross section) can be linked to a project. This allows, for example, the same gridded surface to be viewed on a plan-vie map and cross section at the same time. For more information, see Project Manager.

Default Log Database Connection Settings (Optional)

The default log database connection settings are stored in a DB config file. A DB file can be associated with the Project. When the project is opened this DB file will be automatically loaded. This included database security.

Project Lithology Symbol Library (Optional)

A default lithology symbol library can be associated with the project file. This library will be automatically loaded whenever the project is loaded. See the Lithology Symbol Editor.

Data Source

In the Map Editor, the **Project Data/*Data Source*** function can be used to create Data Sources. A Data Source can contain information about a group or class of boreholes or monitoring intervals. For step-by-step instructions on setting up Data Sources, see the ***Geologic Modelling Tutorial -*** Lesson 5: Working with Data Sources

The following buttons can be found on all of the Data Source tabs.

Create: Creates a new Data Source.

Delete: Deletes an existing Data Source.

Roll-up: Rolls up the Data Source window, but does not close it. To unroll the Data Source menu, simply mouse-over the Data Source menu bar.

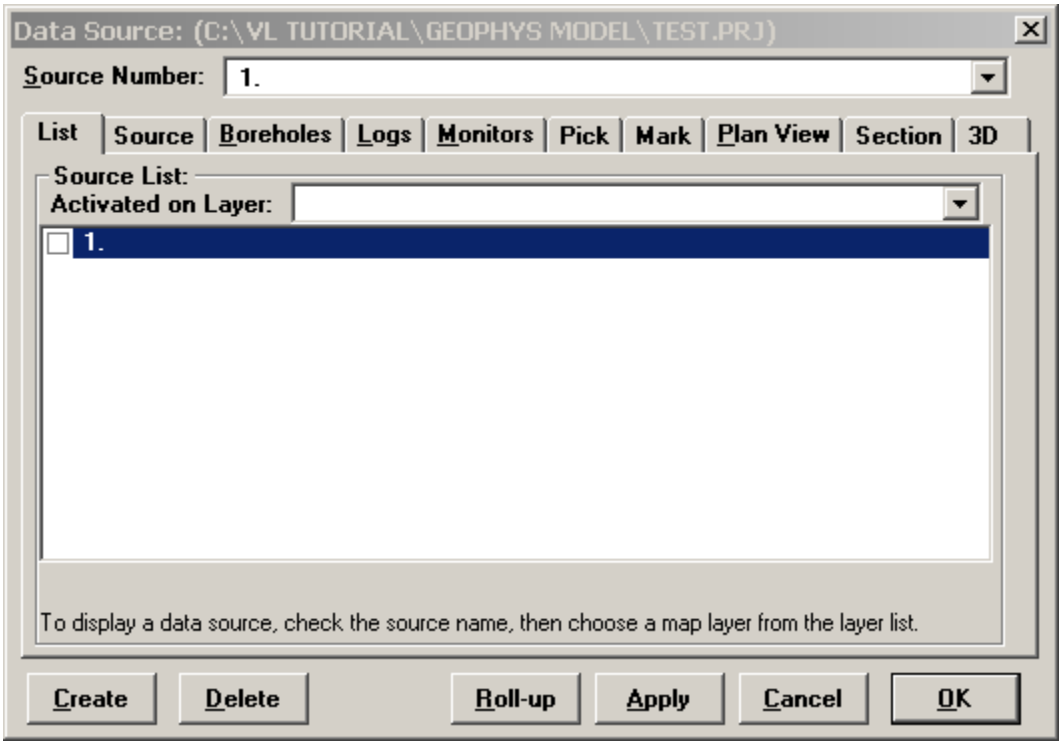
Apply: Applies any changes you made to the Data Source.

Cancel: Cancels the previous action.

OK: Closes the Data Source menu.

Data Source: List Tab

The **List** tab is used to create a name for the Data Source, and to activate (check on) or deactivate (uncheck). For step-by-step instructions on setting this tab, see the ***Geological Modelling Tutorial - Lesson 5:*** Listing the Data Source.



Data Source – List Tab.

Source Number: From the drop-down list displays all the current defined Data Sources for each tab.

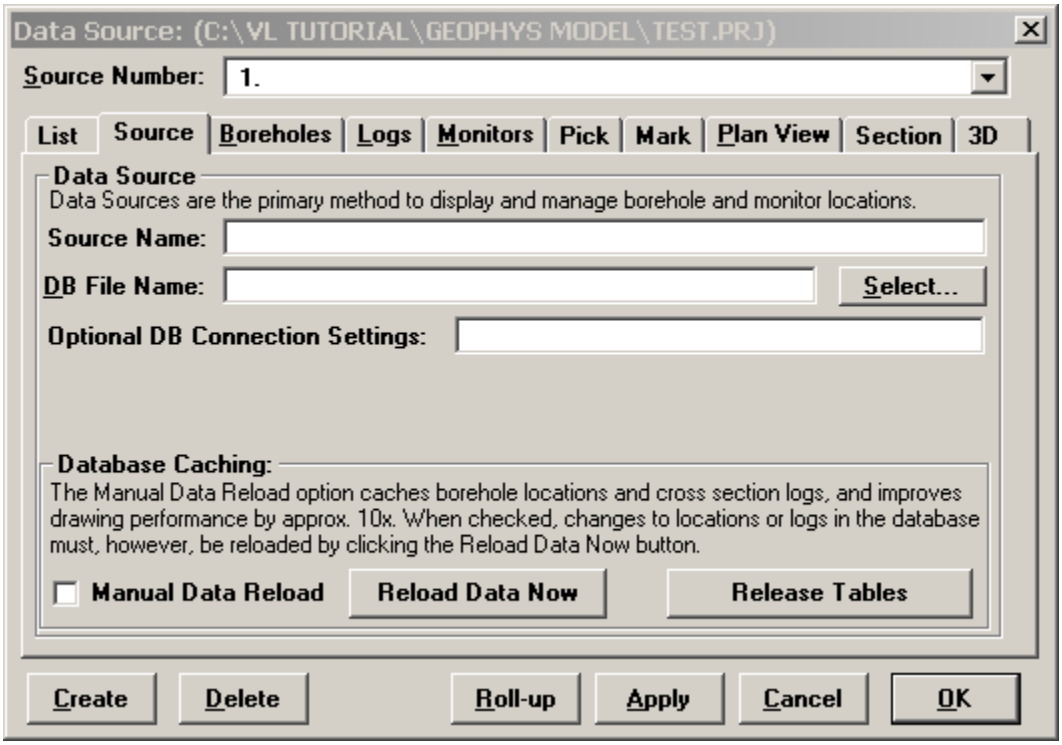
Source List

Displays the defined Data Sources.

Activated on Layer: Shows which layer the current "activated" Data Source is on.

Data Source: Source Tab

The **Source** tab is used to specify the database connectivity for the current Data Source. For step-by-step instructions on setting this tab, see the ***Geological Modelling Tutorial - Lesson 5:*** Database Connectivity for Data Sources.



Data Source – Source Tab.

Data Source

A Data Source is the primary method to display and manage borehole and monitor locations.

Source Name: The user-defined name for the Data Source.

DB File Name: Using the **Select…** button, choose the project database .

Optional DB Connections Settings:

Database Caching

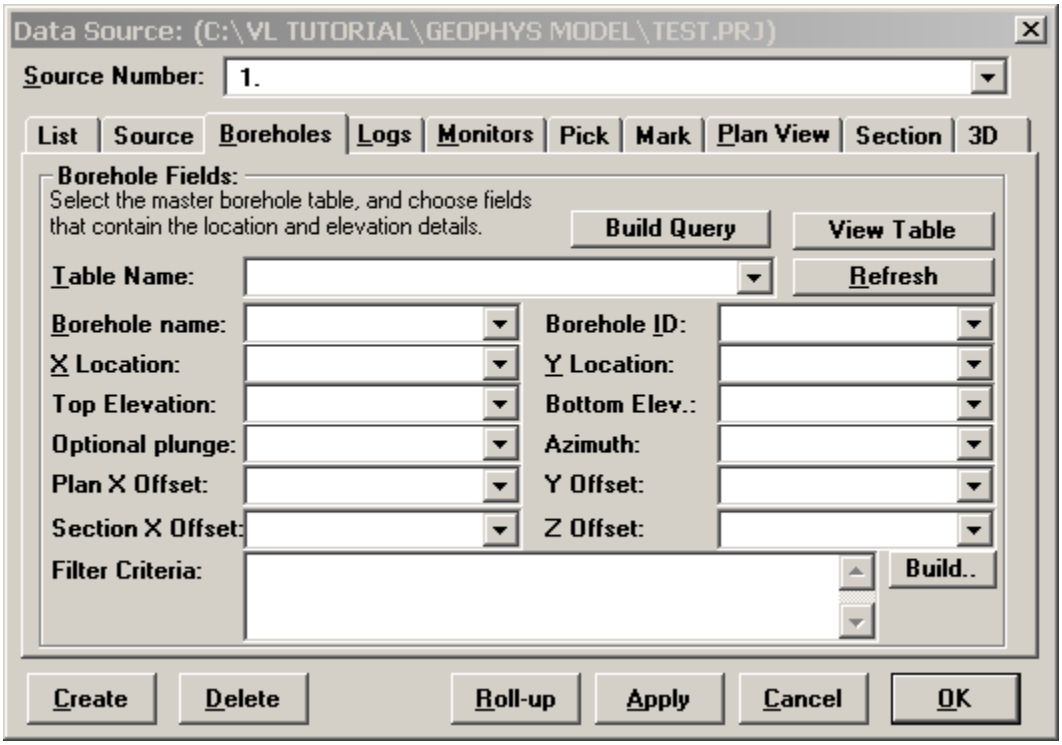
Manual Data Reload: This option caches borehole locations and cross section logs, and improves drawing performance by approximately 10 times. When checked, changes to locations or logs in the database must, however, be re-loaded by clicking the **Reload Data Now** Button.

Reload Data Now: Reloads the changes to locations or logs in the database .

Release Tables: Releases the locations or logs connections from the database.

Data Source: Boreholes Tab

The Boreholes tab is used to specify the database table and fields for the Data Source. For step-by-step instructions on setting this tab, see the ***Geological Modelling Tutorial - Lesson 5:*** Entering Borehole Data for Data Sources.



Data Source – Boreholes Tab.

Borehole Fields

This tab is used to select the master borehole table and chose fields that contain the location and elevation details.

Build Query: Brings up the **Query Builder** to set **Filter Criteria** to filter out data in the borehole table. The query builder can also be opened by pressing the **Build..** button (see below).

View Table: Brings up the selected database table for viewing.

Refresh: Once a table name is selected, refresh will automatically load matching fields into the data fields.

Table name: Select a table from the linked database here.

Borehole Name: Select the field containing the borehole name.

Borehole ID: Select the field containing the borehole ID.

X Location: Select the field containing the X locations.

Y Location: Select the field containing the Y locations.

Top Elevation: Select the field containing the ground surface elevation, or any other top elevation.

Bottom Elev.: Select the field containing the bottom hole elevation.

Optional Plunge: Select the field containing the plunge of the borehole.

Azimuth: Select the field containing the azimuth of the borehole.

Plan X Offset: In plan view the X offset of the borehole

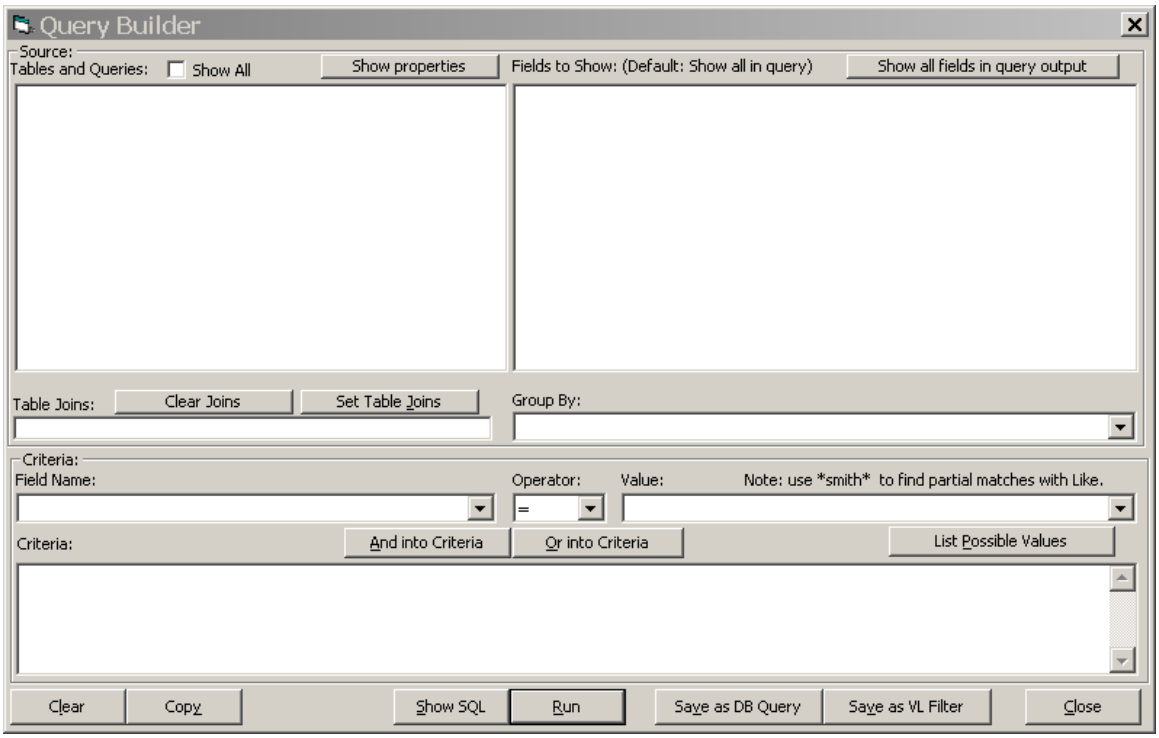
Y Offset: In plan view the Y offset of the borehole

Section X Offset: In cross section view the X offset of the borehole

Z Offset: In plan view the Z offset of the borehole

Filter Criteria: Filters data according to specifications. Criteria set by pressing the **Build..** button.

Build..: Opens the **Query Builder** menu, as shown below.



Data Source – Boreholes Tab – Query Builder.

Query Builder

For a step-by-step example of the **Query Builder**, see the ***Geologic Modelling Tutorial – Lesson 5:*** Entering Borehole Data for Data Sources.

Tables and Queries: Shows the selected borehole table. If **Show All** is checked on, all tables and queries in the linked database are shown. Highlighting a table and clicking on the **Show properties** button will show the properties of the selected table or query.

Fields to Show: Highlighting a table or query in the **Tables and Queries** window shows the fields in that table or query in this window.

Table Joins: If two tables are selected in the **Tables and Queries** window, this allows you to delete the relationships between the tables with the **Clear Joins** button, or add relationships with the **Set Table Joins** button.

Group By: Allows the user to group data by a certain field. Fields in the **Fields to Show** window is shown here for grouping.

Criteria: This section of the form is where the query is created. Select the **Field Name**, **Operator**, and **Value** to set the filter. For example, D_BOREHOLE.BOTTOM_ELEV > 100.

And into Criteria: Uses the AND Boolean function to add the criteria to the filter.

Or into Criteria: Uses the OR Boolean function to add the criteria to the filter.

List Possible Values: Creates a list of possible values that can be used for filtering, according to the selected **Field Name**.

Clear: Clears all information from the form.

Copy: Makes a copy of the query.

Show SQL: Shows the SQL statement driving the query.

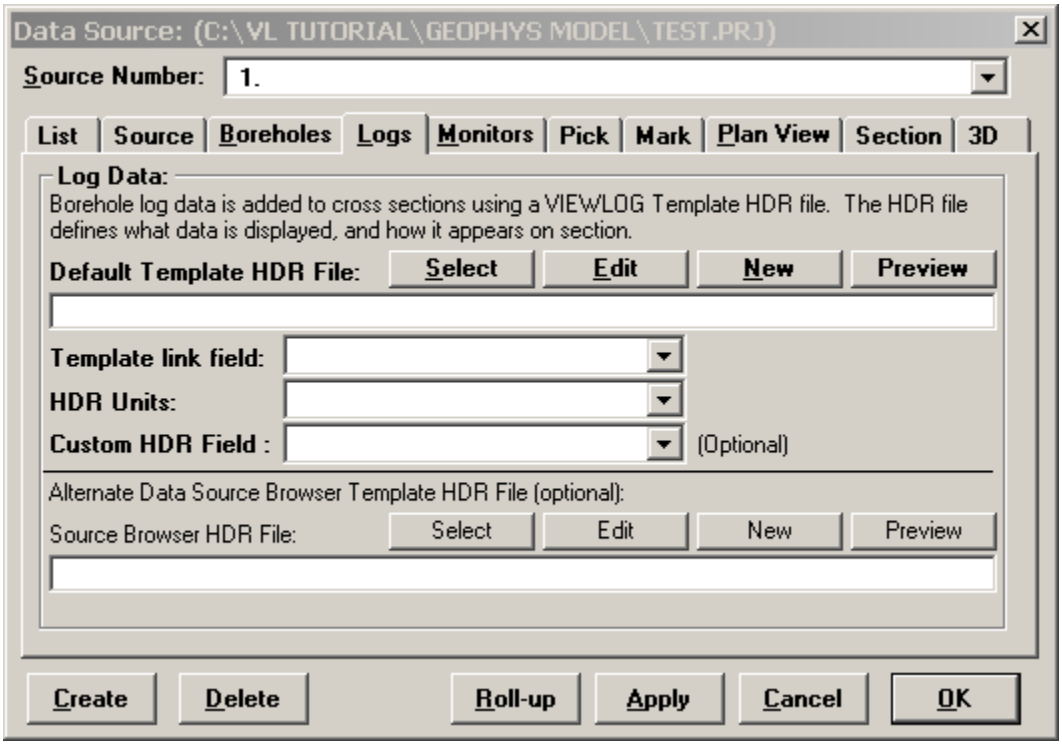
Save as DB Query: Saves the query as a DB Query in the VIEWLOG project file.

Save as VL Filter: Saves the query as a VIEWLOG Filter and displays it in the **Filter Criteria** window of the Boreholes tab of the Data Source menu.

Close: Closes the form. The query will be deleted unless it was saved before this button is pressed.

Data Source: Logs Tab

The **Logs** tab is used to specify Template HDR files, which control the display of boreholes on cross section (default Template HDR) and in the Source Browser Window (Alternate Template HDR file). For step-by-step instructions on setting this tab, see the ***Geological Modelling Tutorial - Lesson 5:*** Creating a Default Template HDR file in the Data Source and Creating an Alternate Template HDR file in the Data Source.



Data Source – Logs Tab.

Log Data

Borehole log data is added to cross sections using a VIEWLOG Template HDR file. The HDR file defines how log data is to be displayed, and how it appears on section. The Logs tab allows the

user to specify two different HDR files: (1) The Default Template HDR, which controls how borehole logs are presented on cross section, and (2) the Alternate Template HDR, which controls how log data is presented in preview mode (preview mode is activated with the **Tools/**Show Source Browser Window menu item).

Default Template HDR File: This window shows the selected template header file used as a default for displaying borehole logs.

Select: Selects a template HDR file to use for the boreholes.

Edit: Opens the selected template HDR file for editing in the Log Editor.

New: Opens the Log Editor for creation of a new template HDR file.

Preview: Previews the template header with the borehole information.

Template link field: Select a field to link the borehole to the template.

HDR Units: The depth units of the boreholes in the database will either be in true elevation or depth.

Custom HDR Field:

Alternate Data Source Template HDR File (optional): Select an alternate template HDR file.

Source Browser HDR file: Used with **Tools/**Show Source Browser Window. Previews the borehole using the selected alternate data source template HDR file.

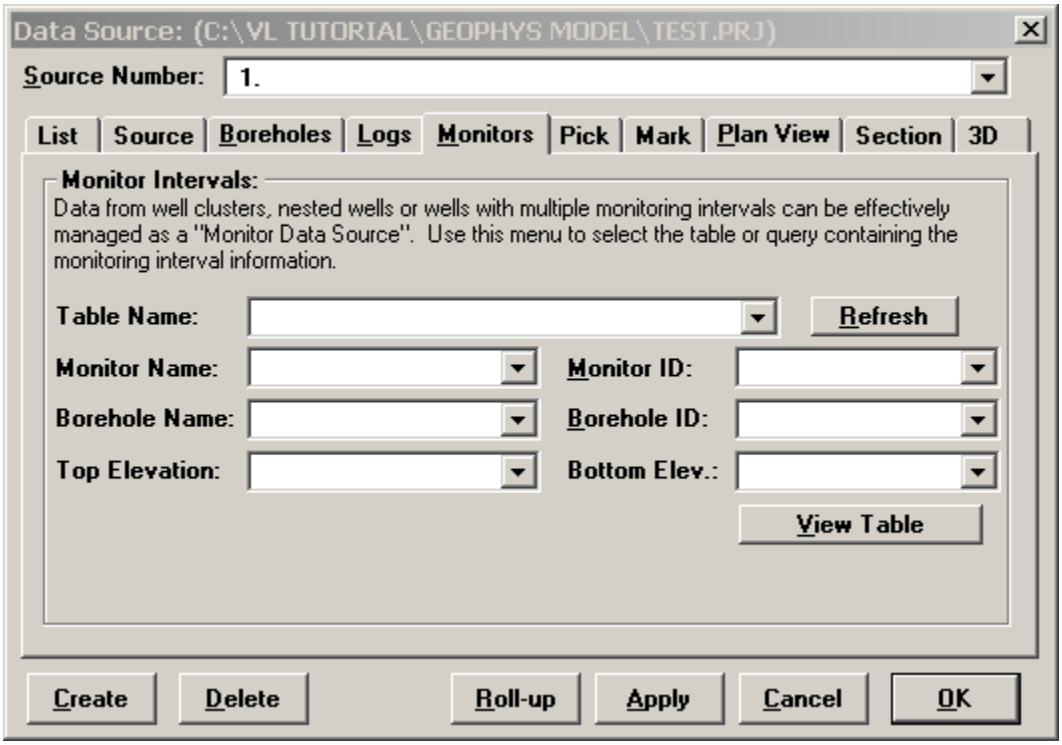
Select: Selects an alternate template HDR file to use for the boreholes.

Edit: Opens the selected alternate template HDR file for editing in the Log Editor.

New: Opens the Log Editor for creation of a new alternate template HDR file.

Preview: Previews the alternate template header with the borehole information.

Data Source: Monitors Tab



Data Source – Monitors Tab.

Monitor Intervals

Data from well clusters, nested wells or wells with multiple monitoring intervals can be effectively managed as a “Monitor Data Source”. Use this menu to select the table or query containing the monitoring interval information.

Table Name: Select the table in the linked database containing the monitor information.

Refresh: Refreshes the field names for the selected table and enters them automatically into the appropriate areas.

Monitor Name: Select the field containing the monitor name.

Monitor ID: Select the field containing the monitor ID.

Borehole Name: Select the field containing the borehole name.

Borehole ID: Select the field containing the borehole ID.

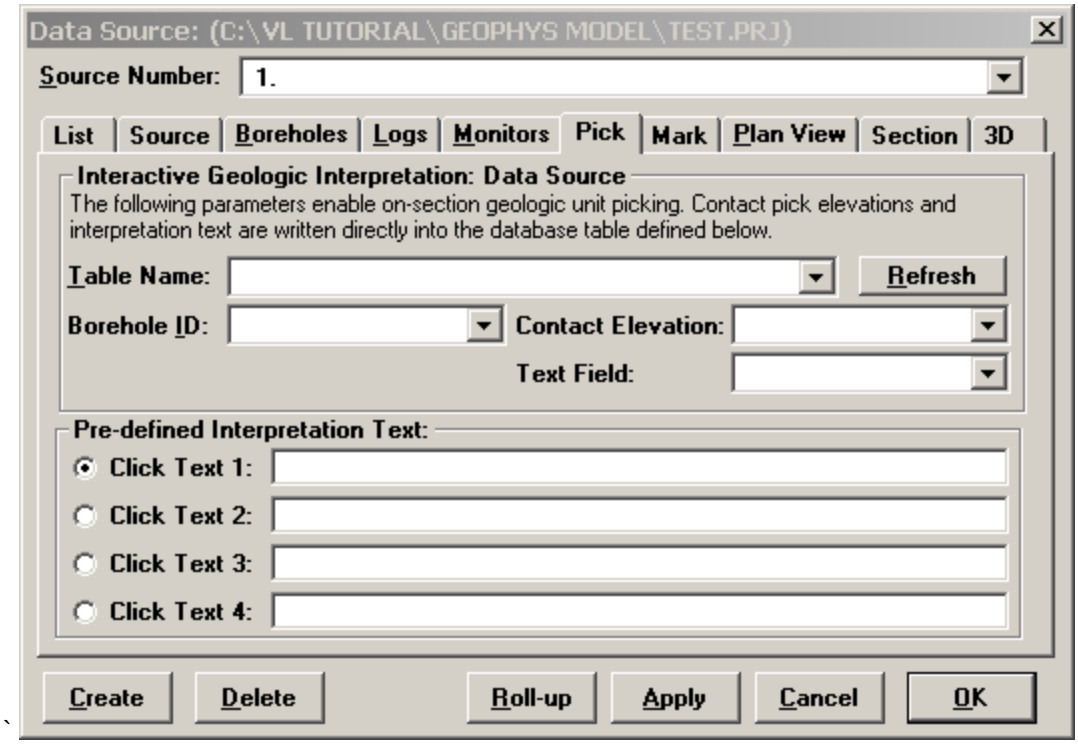
Top Elevation: Select the field containing the borehole top elevation.

Bottom Elevation: Select the field containing the borehole bottom elevation.

View Table: Shows the data from the selected table.

Data Source: Pick Tab

The **Pick** tab is used to set up the on-section, geologic-unit picking function. Pick elevations and interpretation text are written directly back into a database table. ***Geological Modelling Tutorial - Lesson 8: Advanced Mapping Options:*** Section Picking.



Data Source – Pick Tab.

Interactive Geologic Interpretation: Data Source

The following parameters enable on-section geological unit picking. For step-by-step instructions on geologic picking, see the Geologic Modelling Tutorial – Lesson 8: Advanced Mapping Options.

Contact pick elevations and interpretation text are written directly into the database, as defined below.

Table Name: Name of table in the linked database that will hold pick information.

Refresh: Refreshes the fields in the selected table and automatically enters them into a location on the menu, depending on the order of fields in the table.

Borehole ID: Select the field that will hold the borehole ID from the pick.

Contact Elevation: Select the field that will hold the contact elevation from the pick.

Text Field: Select the field that will hold any text information entered with the pick.

Pre-defined Interpretation Text

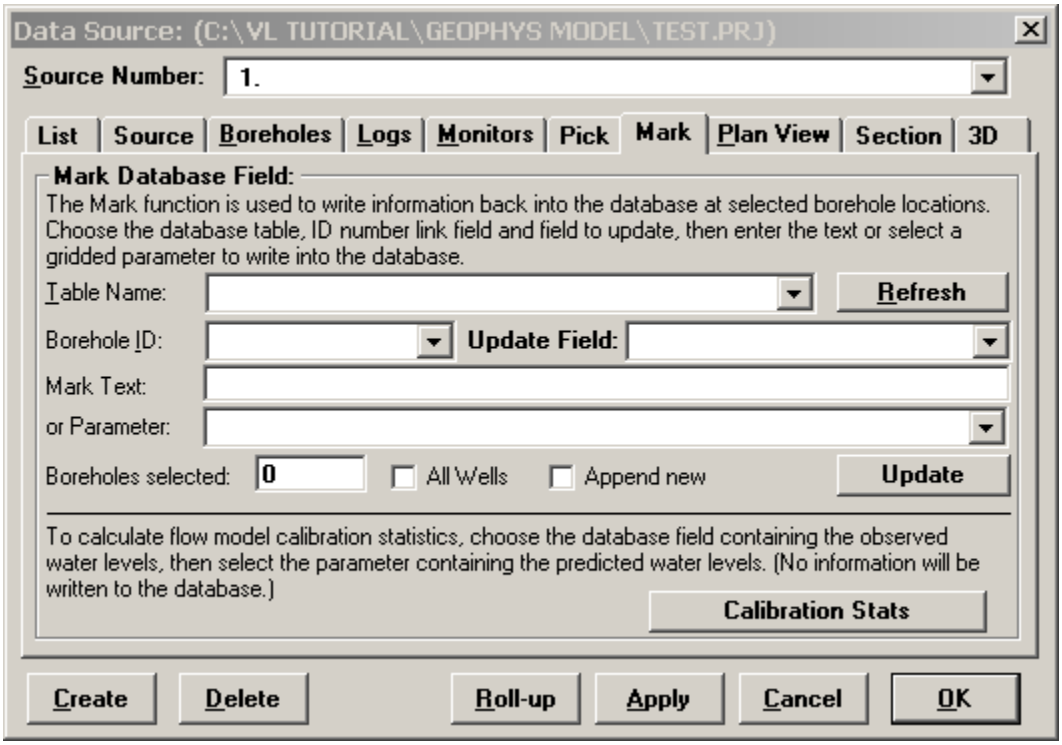
Click Text 1: Entering a unit name here will automatically assign the entered name to each pick.

Click Text 2: Entering a unit name here will automatically assign the entered name to the second click during picking.

Click Text 3: Entering a unit name here will automatically assign the entered name to the third click during picking.

Click Text 4: Entering a unit name here will automatically assign the entered name to the fourth click during picking.

Data Source: Mark Tab



Data Source – Mark Tab.

Mark Database Field

The **Mark** Function is used to write information back into the database at selected borehole locations. Choose the **Table Name**, **Borehole ID** number link field and **Update Field**, then enter the **Mark Text** or select a gridded **Parameter** to write into the database.

Table Name: Select the database table that will hold the information marked back to the database.

Refresh: Refreshes the field names and automatically enters them into locations on the menu, depending on the order of fields in the table.

Borehole ID: Select the field containing the borehole ID.

Update field: Select the field to hold the information that is marked back to the database.

Mark Text/Or Parameter: Select the text to be written back to the database **or** select the parameter to be written back to the database.

Boreholes selected: Shows the number of boreholes selected that will have information written back to the database.

All Wells: Selects all the wells in the Data Source for which information will write back to the database.

Append new: Allows the data to be written back to the database to be appended as new database records instead of updating existing records.

Update: Writes the selected information back to the database.

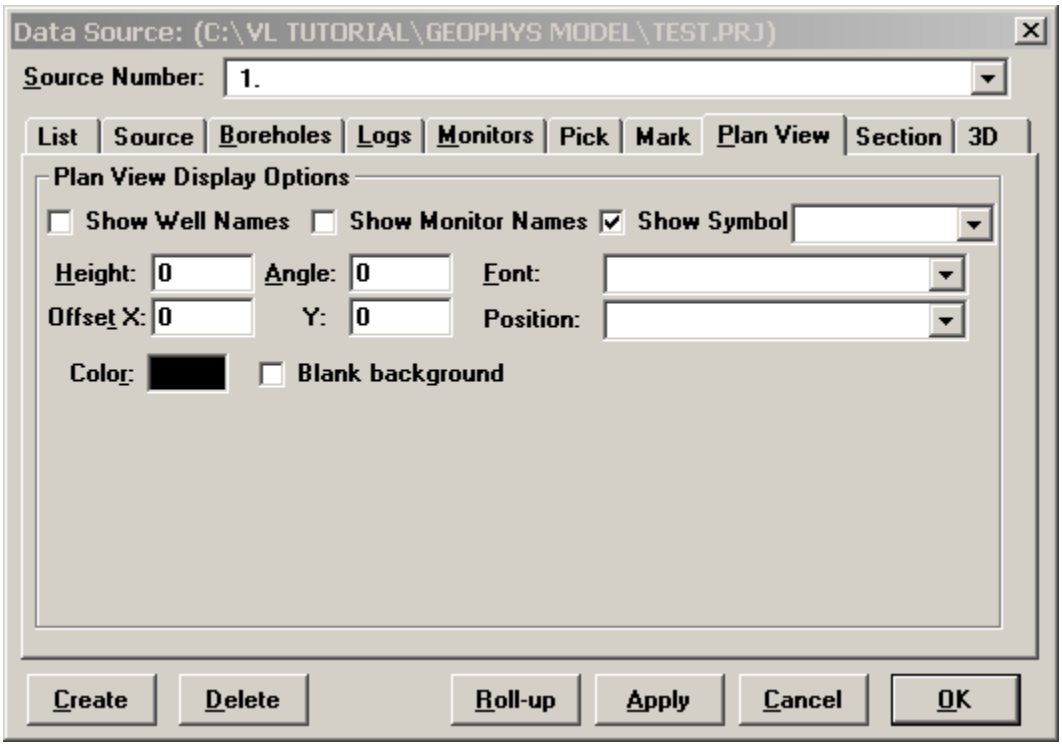
Calibration Stats

To calculate flow model calibration statistics, choose the database field containing the observed water levels, then select the parameter containing the predicted water levels.

> **Note:** No information will be written to the database

Data Source: Plan View Tab

The **Plan View** tab controls how boreholes are displayed in plan view.



Data Source – Plan View Tab.

Plan View Display Options

Show Well Names: Shows the well names in plan view.

Show Monitor Names: Shows the monitor names in plan view.

Show Symbol: Shows a symbol representing the well location in plan view.

Height: Adjusts the height of the name and symbol in plan view.

Angle: Adjusts the angle of the name in plan view.

Font: Changes the font of the name in plan view.

Offset X, Y: Offsets the name from the symbol in the X- and Y directions in plan view.

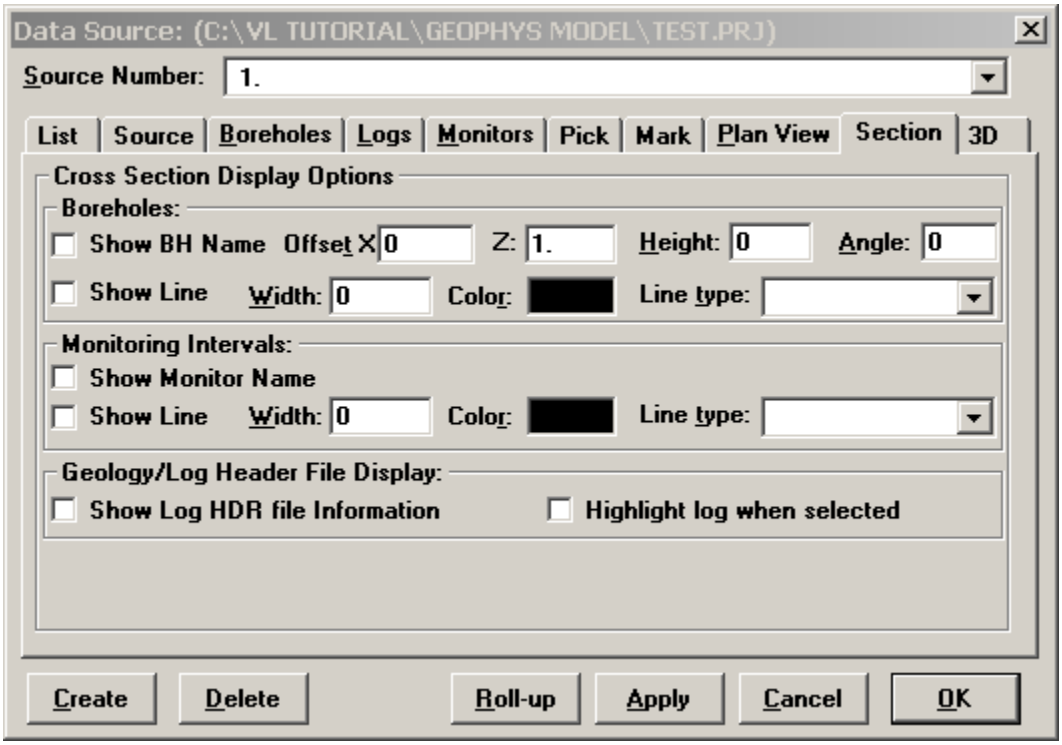
Position: Shows the name in one of five positions relative to the symbol – upper right, lower right, lower left, upper left, and center.

Color: Changes the color of the name and symbol.

Blank background: When this is checked, the area behind the name will be blank, making the name stand out over surfaces or lines.

Data Source: Section Tab

The **Section View** tab controls how boreholes are displayed in cross section. For step-by-step instructions on setting this tab, see the ***Geological Modelling Tutorial - Lesson 5:*** Modifying the Display of a Borehole Data Source on Cross Section.



Data Source – Section Tab.

Cross Section Display Options

Boreholes

Show BH Name: When checked on, the borehole name will be shown in cross-section view.

Offset X, Z: Offsets the borehole name in the X- or Z-direction in cross-section view.

Height: Adjusts the height of the borehole name in cross-section view.

Angle: Adjusts the angle of the borehole name in cross-section view.

Show Line: When checked on, a line representing the borehole in cross-section view will be displayed.

Width: Adjusts the width of the line representing the borehole.

Color: Changes the color of the line representing the borehole.

Line Type: Changes the type of line representing the borehole (i.e., solid, dashed, etc.)

Monitoring Intervals

Show Monitor Name: When checked on, shows the monitor name in cross-section view.

Show Line: When checked on, shows a line representing the monitoring interval in cross-section view.

Width: Adjusts the width of the line representing the monitoring interval.

Color: Changes the color of the line representing the monitoring interval.

Line type: Changes the type of line representing the monitoring interval (i.e., solid, dashed, etc.)

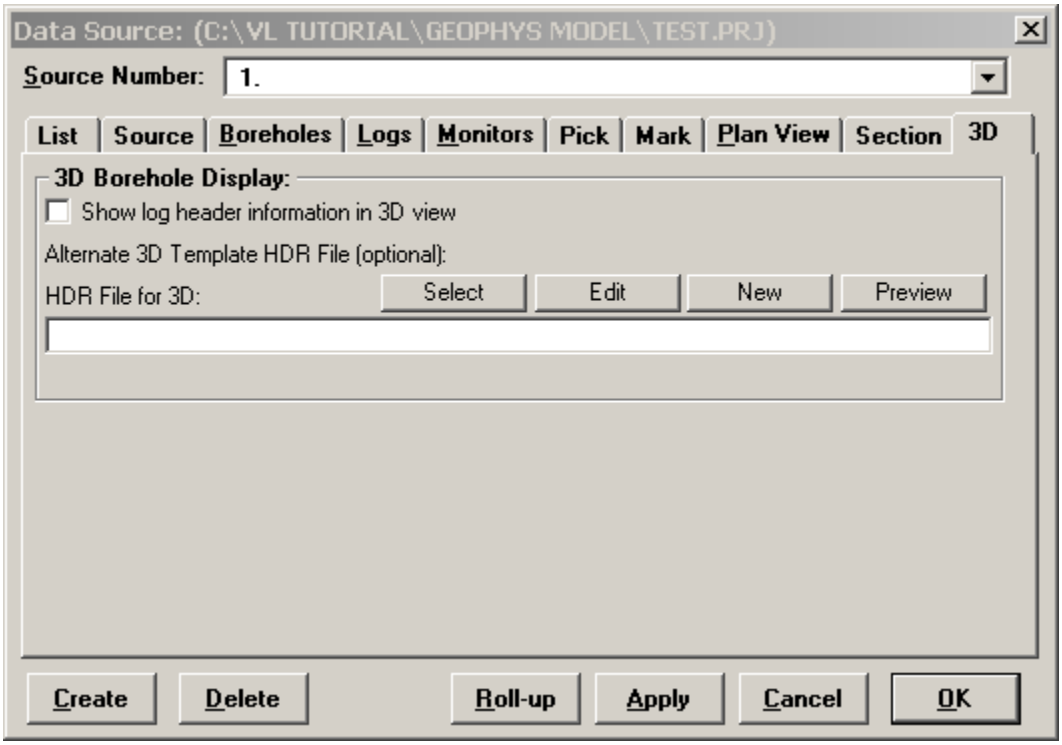
Geology/Log Header File Display

Show Log HDR file Information: When checked on, shows the default template HDR file as selected in the logs tab.

Highlight log when selected: If this is checked on, when a borehole is selected in cross-section view, it will be highlighted.

Data Source: 3D Tab

The **3D** tab controls how boreholes are displayed in 3D view (see



Data Source – 3D Tab.

3D Borehole Display

Show log header information in 3D view: When checked on, the log header information from the selected HDR file for 3D (see below) is displayed in 3D view.

Alternate 3D Template HDR File (optional): Select an alternate template HDR file to be shown in 3D view.

HDR File for 3D: Shows the name of the alternate template header file to be shown in 3D view.

Select: Selects an alternate template HDR file to use for the boreholes in 3D view.

Edit: Opens the selected alternate template HDR file for editing in the Log Editor.

New: Opens the Log Editor for creation of a new alternate template HDR file.

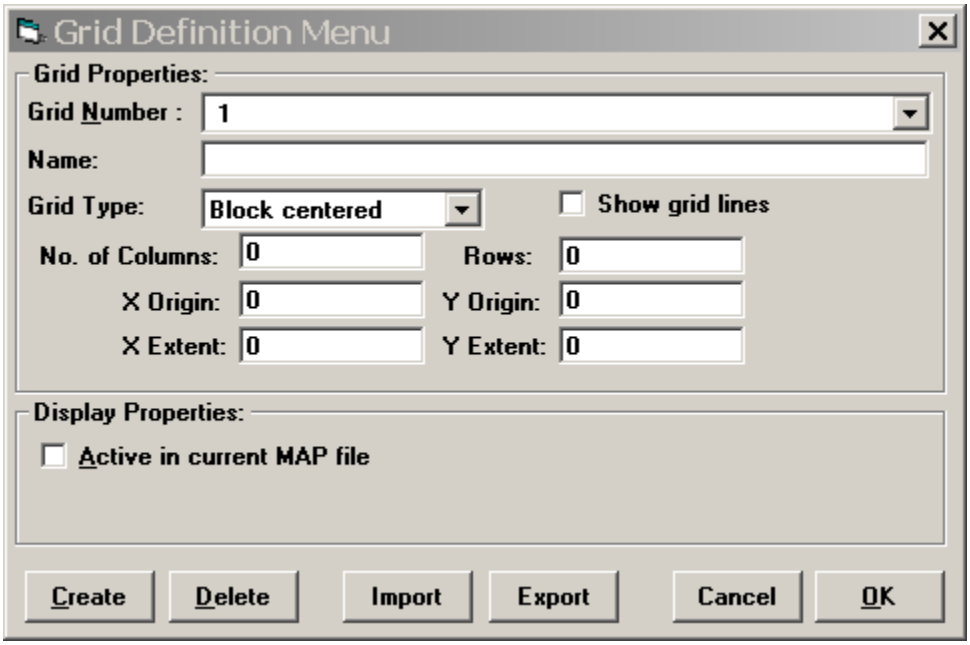
Preview: Previews the alternate template HDR file with the borehole information.

Define New Grid

In the Map Editor, the **Project Data*/Define New Grid*** function can be used to create a new grid. In VIEWLOG, grids are used to direct the interpolation process. For more information, see the ***Geologic Modelling Tutorial - Lesson 9:*** Creating and Displaying Grid Definitions.

Grid Properties

Grid properties can be viewed in the Map Editor with the **Project Data*/Grid Properties*** function.



Grid Definition Menu.

Grid Properties

Grid Number: Shows the number and name of the grid.

Name: Enter a descriptive name of the grid here.

Grid Type: Choose the type of grid as either Block Centered or Finite Volume 2D.

No. of Columns: Specifies the number of columns in the grid.

Rows: Specifies the number of rows in the grid.

X Origin: Specifies the X value of the starting point of the grid.

Y Origin: Specifies the Y value of the starting point of the grid.

X Extent: Specifies the X value of the end point of the grid.

Y Extent: Specifies the Y value of the end point of the grid.

Display Properties

Active in current Map file: When checked on, the grid will be displayed in plan view in the current map file. If checked, the following options appear:

Drawing Layer: Allows the user to specify which layer the grid will appear.

Pen color: Specifies the color of the grid, when drawn in plan view.

Line type: Specifies the line type for the grid lines (i.e., solid, dashed etc.)

Width: Specifies the line width for the grid lines.

Edit Grid

In the Map Editor, there are four options within the **Project Data*/Edit Grid*** menu. These include:

1. Select Grid for Editing
2. Refine Region
3. Add/Remove Row
4. Add/Remove Column

For a lesson on VIEWLOG grids, see the ***Geologic Modelling Tutorial –*** Lesson 9: Working with VIEWLOG Grids.

Select Grid for Editing

In the case where a project contains more than one grid, the Map Editor, the **Project Data/Edit Grid/*Select Grid for Editing*** function is used to choose which grid in the current project will be edited. When this is selected, the user will be required to choose the grid they wish to use for subsequent editing processes.

Refine Region

In the Map Editor, a portion of a grid can be refined with the **Project Data/Edit Grid/*Refine Region*** function. When this option is selected, use the mouse and left-click-drag to define a region to be refined.

Add/Remove Row

Rows can be added or removed where the user wants higher or lower resolution, respectively, within the grid. To add a row, select **Project Data/Edit Grid/*Add/Remove Row,*** and left-click on the mouse in the location of the desired new row. To remove a row, use the right button on the mouse; in this case, the grid row below the location of the right-mouse click will be deleted.

Add/Remove Column

Columns can be added or removed where the user wants higher or lower resolution, respectively, within the grid. To add a column, select **Project Data/Edit Grid/*Add/Remove Column***, and left-click on the mouse in the location of the desired new column. To remove a column, use the right button on the mouse; in this case, the grid column to the right of the right-mouse click will be deleted.

Data Parameter

In the Map Editor, the **Project Data/*Data Parameter*** function can be used to create Data Parameters. For step-by-step instructions on setting up Data Parameters, see the ***Geologic Modelling Tutorial –*** Lesson 6: Working with Data Parameters. The following is a detailed list of each tab in the window.

The following buttons can be found on all of the Data Parameter tabs:

Create: Creates a new Data Parameter.

Delete: Deletes an existing Data Parameter.

Roll-up: Rolls up the Data Parameter window, but does not close it. To unroll the Data Parameter menu, simply mouse-over the Data Parameter menu bar.

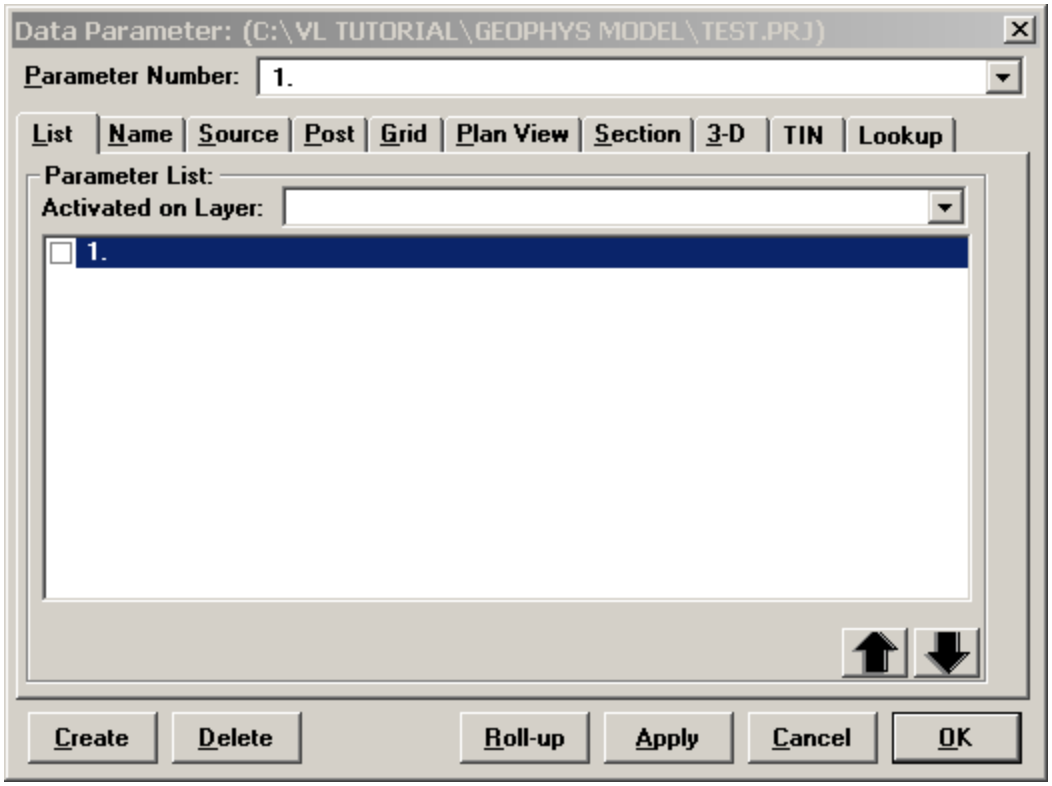
Apply: Applies any changes you made to the Data Parameter

Cancel: Cancels the previous action.

OK: Closes the Data Parameter menu.

Data Parameter: List Tab

In the Data Parameter window, the **List** tab is used for activating or deactivating the Data Parameters (For more information, see the ***Geologic Modelling Tutorial, Lesson 6:*** Creating and Listing Data Parameters.)



Data Parameter – List Tab.

Source Number: From the drop down list displays all the current defined Data Parameters for each Data Source tab.

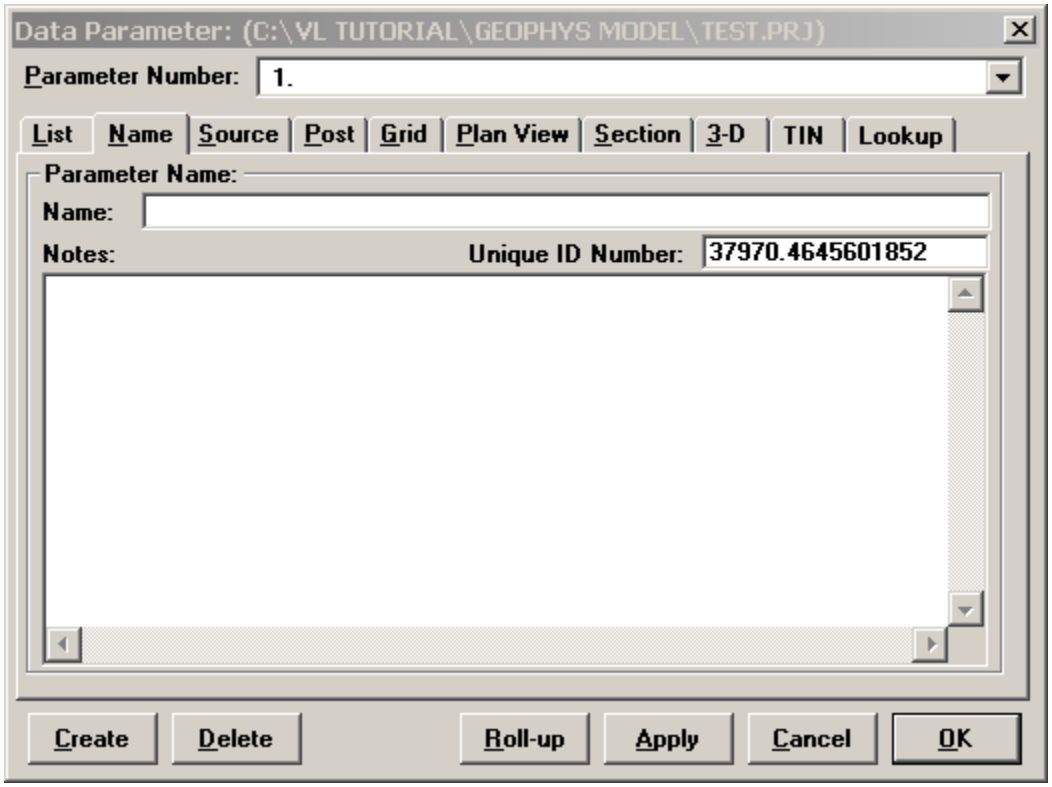
Source List

Displays the defined Data Parameters. When “activated” (checked on), will make that Data Parameter current.

Activated on Layer: Shows which layer the current “activated” Data Parameter is on.

Data Parameter: Name Tab

The **Name** tab is used to change the name of a Data Parameter. Also, descriptive notes can be added for each Data Parameter.



Data Parameter – Name Tab.

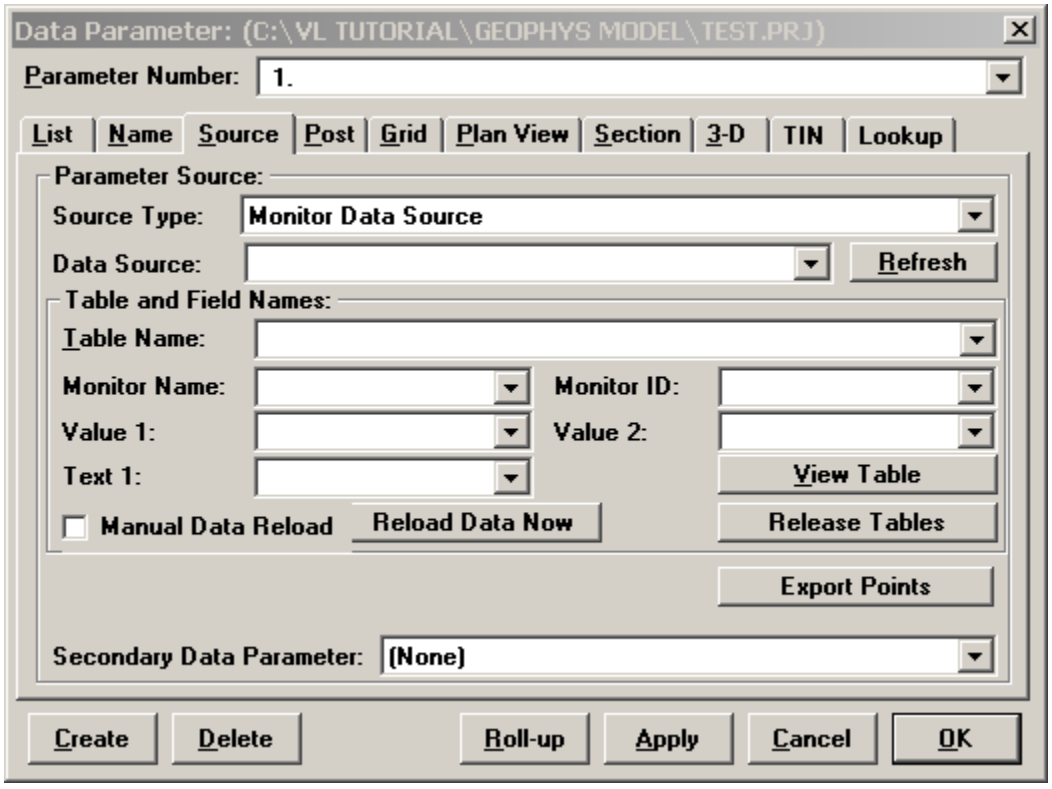
Name: Type in the name of the Data Parameter here.

Unique ID Number: Automatically assigns a unique ID number to the Data Parameter.

Notes: Type in any details about the Data Parameter here.

Data Parameter: Source Tab

In the Data Parameter window, the **Source** tab is used to connect the Data Parameter to the database. (For more information, see the ***Geologic Modelling Tutorial, Lesson 6:*** Creating a Data Parameter that is Linked to the Database.)



Data Parameter – Source Tab.

Source Type: Selects the type of source used to display the Data Parameter, depending on the information in the selected table of the database. The available options for the **Source Type** are:

1. **Monitor Data Source:** This source type uses the monitor information from a Data Source as the positional reference. Typically, this type is used for generating water level or concentration maps, because such measurements are frequently recorded within a monitoring interval. The following link options are required:
   a. Data Source Link
   b. Database query containing:
      i. Monitor name and ID number
      ii. Value 1 (a single numeric value, e.g., water level)
2. **Borehole Data Source x, y, value:** This type provides a direct link to the borehole locations. Typically, it is used for generating surfaces from geologic unit picks, as geology is related to the borehole. The following like options are required:
   a. Data Source Link
   b. Database query that contains:
      i. Borehole name and ID number
      ii. Value 1 (a single numeric value, e.g., elevation of top of bedrock surface).
3. **Map Object x,y,z (elevation):** Data Parameters can also be linked to objects on a map. Map objects have both a z-elevation and a user-defined “attribute” value. This source type can be used to generate a gridded surface from the elevation of existing

contour lines. All location and elevation information from a single selected map layer is used.

4. **Borehole x,y,z,value:** This source type is similar to (2) above, with the exception that the measurements are truly three-dimensional. Typically, this type is used for generating 3D gridded parameters, such as 3D plumes. The following link options are required:
   a. Data Source Link
   b. Database query that contains:
      i. Borehole name and ID number
      ii. Elevation, Value 1 (a single numeric value, e.g., elevation of top of bedrock surface).
5. **Simple x,y,value query:** This type is a simple link to a database query.
6. **Map Object x,y,(parameter attribute):** Like type (3) listed above, the attribute values of map objects can also be used in the gridding process. All location and attribute information from a single map layer is used.
7. **Named map object x,y,z elevation:**

Other buttons

Manual Data Reload: This option caches database information, and improves drawing performance by approximately 10 times. When checked, changes to data in the database must be re-loaded by clicking the **Reload Data Now** Button.

Reload Data Now: Reloads the changes to information in the database .

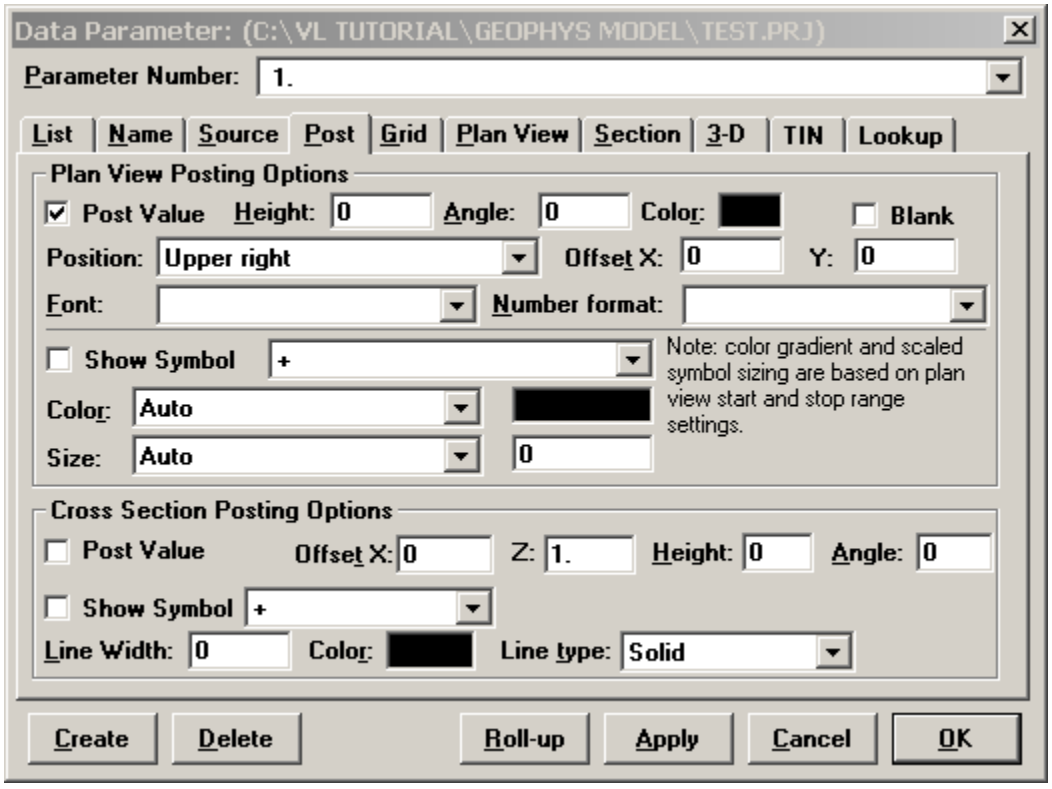
Release Tables: Releases the table connections from the database.

Export Points: Used to expo works with any type of source…including polylines. Works with 3D horizons on shifted sections

Secondary Data Parameter: The Secondary Data parameter allows data from a second Data Parameter to be merged with the current parameter prior to gridding.

Data Parameter: Post Tab

The **Post** tab controls the posting of the Data Parameter in both plan view and cross section. (For more information, see the ***Geologic Modelling Tutorial, Lesson 6:*** Creating a Data Parameter that is Linked to the Database.)



Data Parameter – Source Tab.

Plan View Posting Options

Post Value: Shows the value of the data point on plan view when checked on.

Height: Adjusts the height of the posted value on plan view.

Angle: Adjusts the angle of the posted value on plan view.

Color: Changes the color of the posted value text on plan view.

Blank: Draws a white box behind the numbers that get posted.

Position: The value can be shown in one of five positions – upper right, lower right, lower left, upper left, and center – relative to the data point.

Offset X, Y: Offsets the value in the X- and Y-direction relative to the data point.

Font: Changes the font of the posted data value.

Number format: Choose from a variety of formats for numerical data values.

Show Symbol: When this is checked on, a symbol representing the position of the data point is shown. The color and size of the symbol can be changed using the **Color** and **Size** drop down lists.

Cross Section Posting Options

Post Value: Shows the value of the data point on section view when checked on.

Offset X, Z: Offsets the value in the X- and Z-direction relative to the data point in section view.

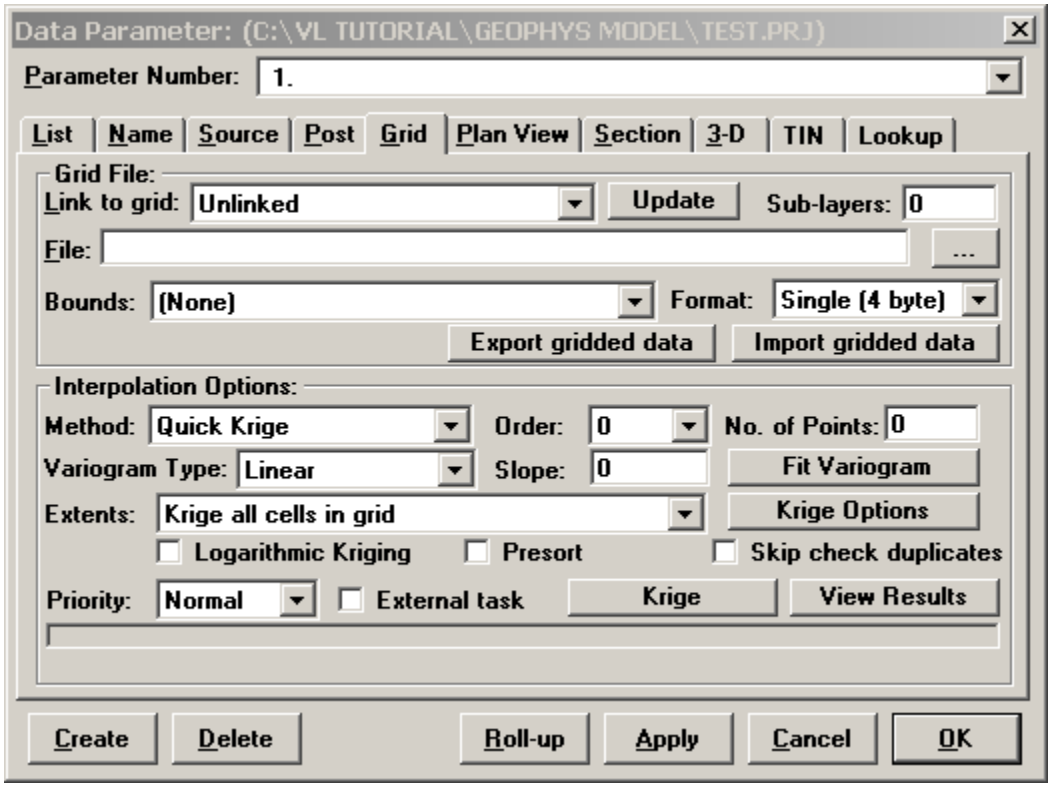
Height: Adjusts the height of the posted value on section view.

Angle: Adjusts the angle of the posted value on section view.

Show Symbol: When this is checked on, a symbol representing the position of the data point is shown. The symbol type can be selected using the drop down box. The color and line type of the symbol can be changed using the **Color** and **Line type** drop down lists. The line width can be adjusted using the **Line Width** option.

Data Parameter: Grid Tab

The **Grid** tab is used to link the current Data Parameter to a grid file. Also, interpolation of the gridded data is performed in this tab. . (For more information, see the ***Geologic Modelling Tutorial, Lesson 6:*** Importing a Grid File for a Data Parameter and Creating a Data Parameter that is Linked to the Database.)



Data Parameter – Grid Tab.

Grid File

Link to grid: Select a defined grid to link to. The Data Parameter will be interpolated using the parameters for the selected grid.

Update: Updates the link to the grid.

Sub-layers: Used to define sub-layers for cross-section gridding.

File: Select a file to output the interpolated grid.

Bounds: From the drop down menu, select pre-defined bounds for clipping the interpolation.

Format: Select from Single (4 byte) or Integer (2 byte) precision

Note: Modflow boundary files must be 2-byte integers.

Export Gridded Data: Grids can be exported in five different formats:

1. AXCII XYZ grid data (.xyz)
2. EVS Geo grid data (.geo)
3. Surfer ASCII grid data (.sgr)
4. ArcInfo AGR ASCII grid data (.agr)
5. Modflow 8E14.6 ASCII grid data (.dat).

Import Gridded Data: Grids can be imported from any of the above formats, plus text files and ERMapper binary grid files.

Interpolation Options

For more information on interpolation options, please see the reference manual.

Method: Choose the method of interpolation from several options, including;

1. Quick Krige
   a. Kriging is a geostatistical gridding method that has proven useful and popular in many fields. This method produces visually appealing maps from irregularly spaced data. Kriging attempts to express trends suggested in your data, so that, for example, high points might be connected along a ridge rather than isolated by bull's-eye type contours.
2. **Full Kriging**
3. **Block Kriging**
   a. **Block Kriging** estimates the average value of the rectangular blocks centered on the grid nodes. The blocks are the size and shape of a grid cell. Because **Block Kriging** is estimating the average value of a block, it generates smoother contours (block averaging smooths). Furthermore, since **Block Kriging** is not estimating the value at a point, **Block Kriging** is not a perfect interpolator. That is even if an observation falls exactly on a grid node, the **Block Kriging** estimate for that node does not exactly reproduce the observed value.
4. **Inverse Distance**
   a. The **Inverse Distance** to a Power gridding method is a weighted-average interpolator, and can be either an exact or a smoothing interpolator. With **Inverse Distance**, data are weighted during interpolation such that the influence of one point relative to another declines with distance from the grid node. Weighting is assigned to data through the use of a weighting power that controls how the weighting factors drop off as distance from a grid node increases. The greater the weighting power, the less effect points far from the grid node have during interpolation. As the power increases, the grid node value approaches the value of the nearest point. For a smaller power, the weights are more evenly distributed among the neighboring data points.
5. **Nearest Neighbor**
   a. The **Nearest Neighbor** gridding method assigns the value of the nearest point to each grid node. This method is useful when data are already evenly spaced. Alternatively, in cases where the data are nearly on a grid with only a few missing values, this method is effective for filling in the holes in the data.

Order: Order/power in which the selected method is to be kriged.

No. of Points: Number of points for variogram analysis.

Variogram Type: Allows the user to predefine the type of variogram to be applied to the kriging process.

Slope: Allows the user to define the slope of the variogram.

Extents: Allows the user control of the area to be kriged.

The selection includes:

1. Krige all cells in grid
2. Krige cell within the selected polygon
3. Krige cells outside the selected polygon
4. Krige cells with data from within selected polygon
5. Krige cell with data from outside selected polygon
6. Fault kriging using all selected fault polylines
7. Krige cells within polygon with edge control

Fit Variogram: When selected, the user will have full control over the Variogram analysis. Please refer to the reference manual for further information on Variogram analysis

Krige Options: Creates new output parameters for the define grid ranging from Standard Error, Variance, Drift, Drift Error and Residual.

Logarithmic Kriging: When checked, the kriging process will use logarithmic kriging.

Presort: Presorts the data before the kriging process.

Skip Check Duplicates: The program normally checks for duplicates prior to kriging. Checking this box will skip this check.

Priority: Increases the processor priory of the interpolation task (i.e.. when set to a lower value other applications will appear more responsive).

External Task: Enables the user to run kriging in the background, by creating a VIEWLOG *.VLI file, similar to a batch kriging process.

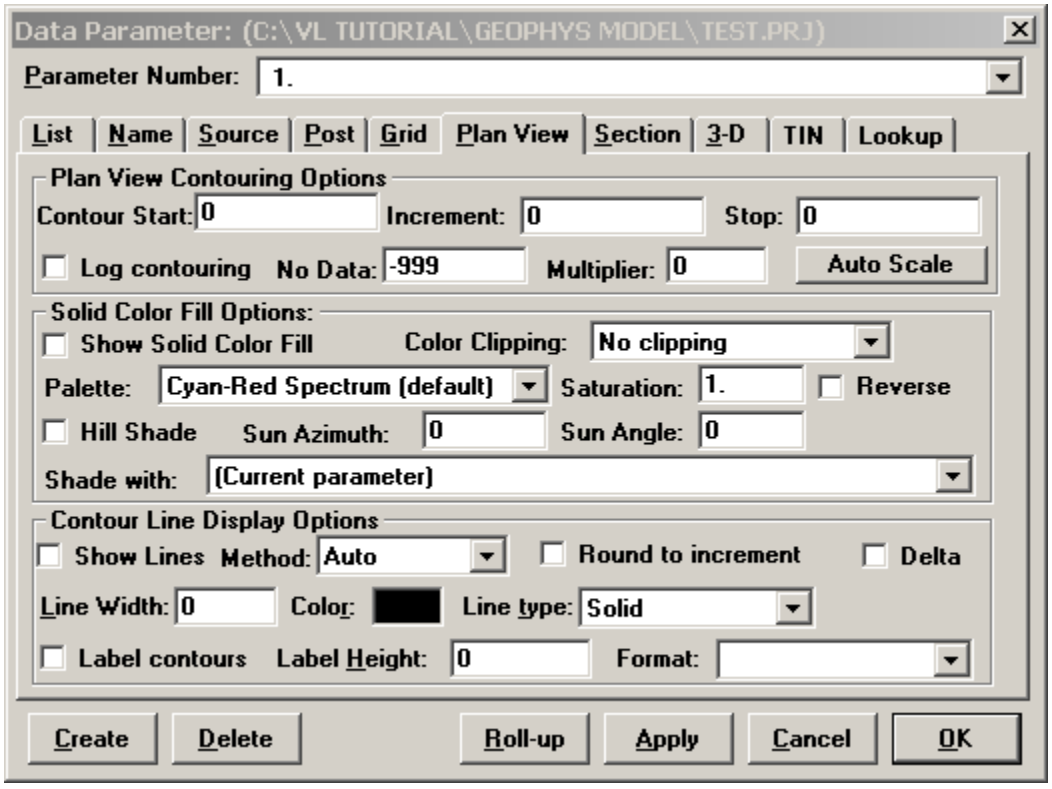
Krige: Pressing this button begins interpolation. Progress is shown on a progress bar located immediately below the **Krige** button.

View Results: Show the grid results in numerical form.

> **Note:** For more information on kriging and variogram analysis please refer to the VIEWLOG reference manual.

Data Parameter: Plan View Tab

The **Plan View** tab controls how the Data Parameter will be displayed in plan view. For more information, see the ***Geologic Modelling Tutorial, Lesson 6:*** Importing a Grid File for a Data Parameter.)



Data Parameter – Plan View Tab.

Plan View Contouring Options

Contour Start: Select an interval at which the contouring starts.

Increment: Select an increment for the contouring.

Stop: Select an interval at which the contouring ends.

Log Contouring: Contours the data in logarithmically.

No Data: The VIEWLOG no data default no data value is –9999.

Multiplier: Multiply a grid by a predefined factor (e.g., elevation conversion of feet to meters but leave the original value alone).

Auto Scale: Automatically detects the lowest and highest values for the surface and enters it in the contour start and stop windows, and selects an appropriate increment for the contouring.

Solid Color Fill Options

Show Solid Color Fill: When checked on, the Data Parameter will be shown on plan view with color contours.

Color Clipping: Choose from **No clipping**, **Clip full range**, **Clip start** and **Clip stop**. The color can be clipped according to the contouring start and stop.

Palette: Choose from **Cyan-Red Spectrum (default)**, **Blue-Red Spectrum**, **Black and White**, or **Single color brightness scale**.

Saturation: Controls the saturation of the color fill (Range: 0 to 1). 0 is default (saturation is not applied) applies to the entire spectrum of colour shades.

Reverse: Swaps the order of the colour spectrum.

Hill Shade: When checked on, this option illuminates the surface from a specified direction (**Sun Azimuth**) and angle (**Sun Angle**) as if the sun was shining on the surface.

Shade with: Allows the user to pick the colors of one Data Parameter and use the colour shading of another Data Parameter, creating a draping effect.

Contour Line Display Options

Show Lines: When checked on, contour lines will be displayed on plan view.

Method: Choose from Auto, Normal, or Fast.

Round to Increment: Rounds the contour values to the nearest increment.

Delta: Will put a continuous line at the point where a change occurs in grid values; for example where you have defined zones.

Line Width: Adjusts the thickness of the displayed line.

Color: Changes the color of the displayed line.

Line type: Changes the type of line displayed, i.e. solid, dashed, etc.

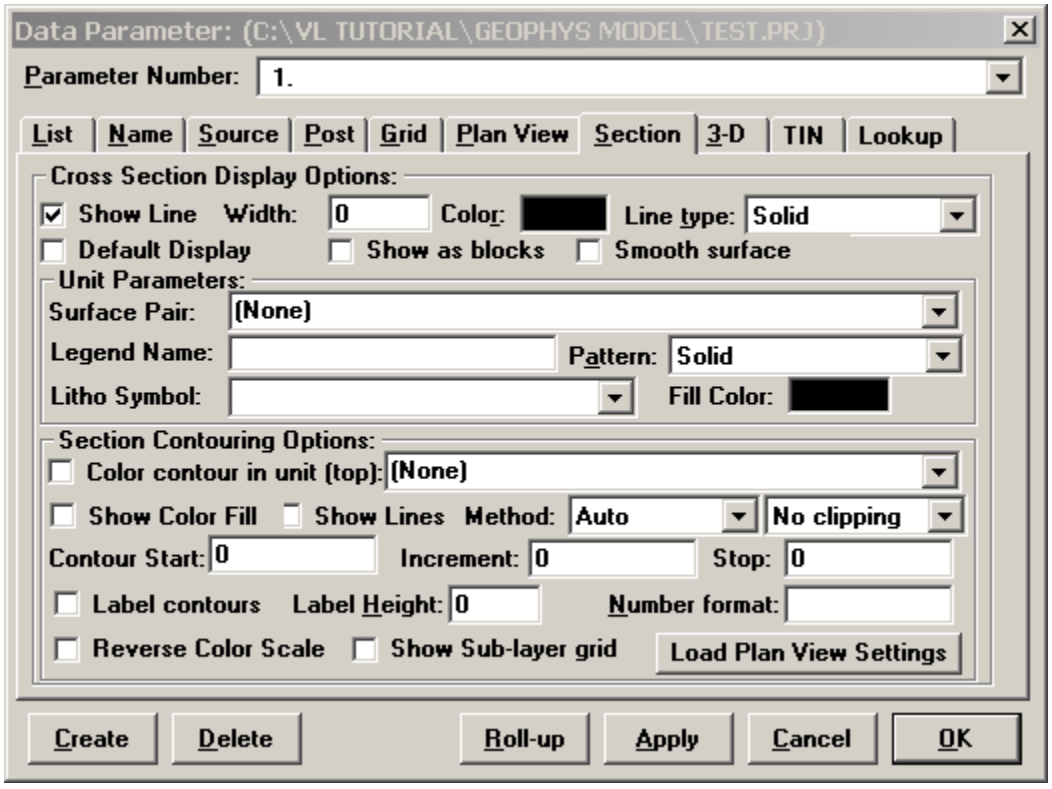
Label Contours: When checked on, labels for the contours are displayed.

Label Height: Adjusts the height of the displayed contour labels.

Format: Changes the number format of the displayed contour label.

Data Parameter: Section Tab

The **Section** tab controls how the Data Parameter will appear in cross section. For more information, see the ***Geologic Modelling Tutorial, Lesson 6:*** Preparing a Cross Section with Data Parameters.)



Data Parameter – Section Tab.

Cross-Section Display Options

Show Line: When checked on, a line is shown that represents the borehole in cross section.

Width: Changes the width of the line displayed in section.

Color: Changes the color of the line displayed in section.

Line Type: Changes the type of line displayed in section (e.g., **Solid**, **Dash**, etc.)

Default Display: If checked, the current Data Parameter will be drawn on all subsequent cross sections.

Show as blocks: Will display the section as blocks

Smooth surface: Smoothes the line representing the surface in section.

Unit Parameters: The following options allow the user to shade units in section.

Surface Pair: Choose a surface to pair with the current surface. Shading will be shown between the two surfaces.

Legend Name: Provide a title for the legend that is automatically generated when using this function (if no name is provided here, the legend will use the name of the Data Parameter).

Pattern: Choose a pattern to shade between the two surfaces.

Litho Symbol: A lithology symbol can be chosen instead of a pattern to shade between the two surfaces.

Fill Color: Choose a color for the pattern or litho symbol.

Section Contouring Options

Colour Contour in Unit (top): When checked on, color contouring will be displayed in the selected unit; the drop down list selects the unit top.

Show Color Fill: When checked on, color contouring will be displayed in the selected unit.

Show Lines: When checked on, contour lines will be shown in the selected unit.

Method: For the first drop down box, choose the method from auto, normal, or fast; from the second, choose the clipping type.

Contour Start: Select the contour start value.

Increment: Select an increment for contours.

Stop: Select the contour stop value.

Label contours: When checked on, contours will be labeled.

Label Height: Adjusts the contour label height.

Number format: Changes the formatting of the displayed contour label.

Reverse Color Scale: Reverses the colour scale displayed.

Show Sub-Layer Grid: Shows the sub layer grid defined for section gridding.

Load Plan View Settings:

Data Parameter: 3-D Tab

3-D Surface Display

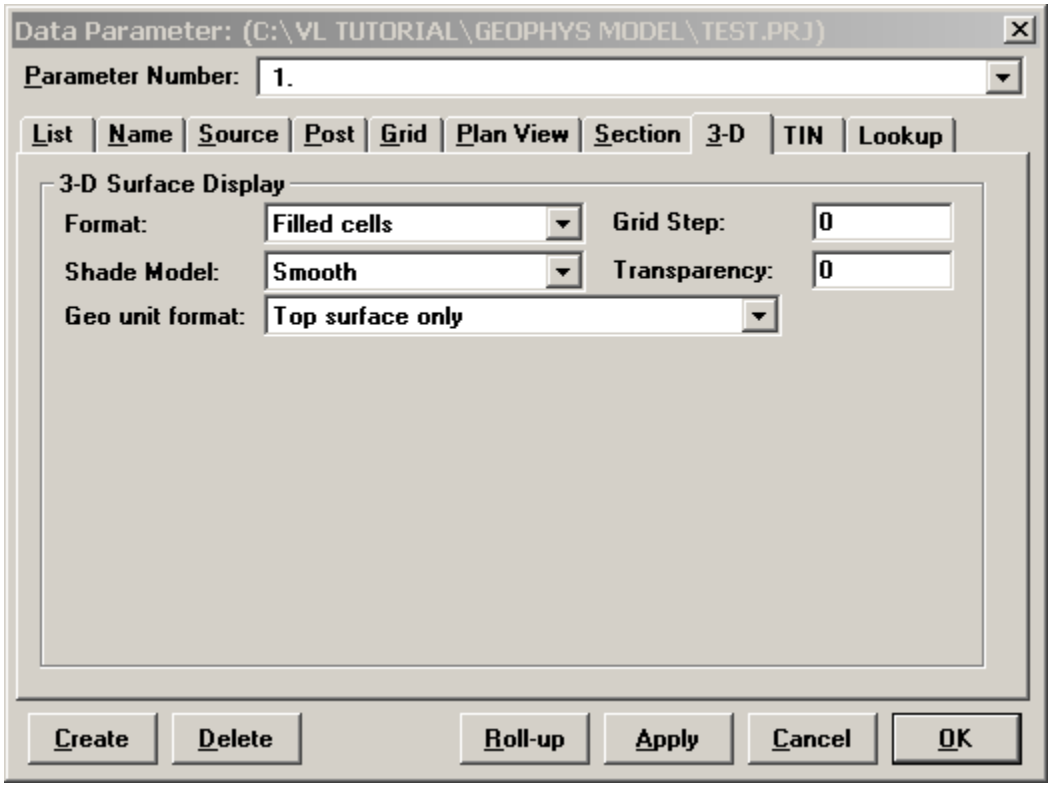
Format: Choose from **Filled cells**, **Mesh**, **Filled Mesh**, or **Vertex points**.

Grid Step:

Shade Model: Choose from **Smooth** or **Flat**.

Transparency: Allows the user to assign a percentage of transparency to the 3-D display.

Geo unit format: Choose from displaying the unit as a **Top surface only**, **Top and bottom surfaces**, **Top shell (top and sides)**, **Shell (top, bottom, and sides)**, and **Solid Filled object**.



Data Parameter – 3-D Tab.

Data Parameter: TIN Tab

UNDER CONSTRUCTION

Show TIN: Displays the TIN surface.

Type: Allows the user to choose between **Surface** or full **3D Volume** Tinning.

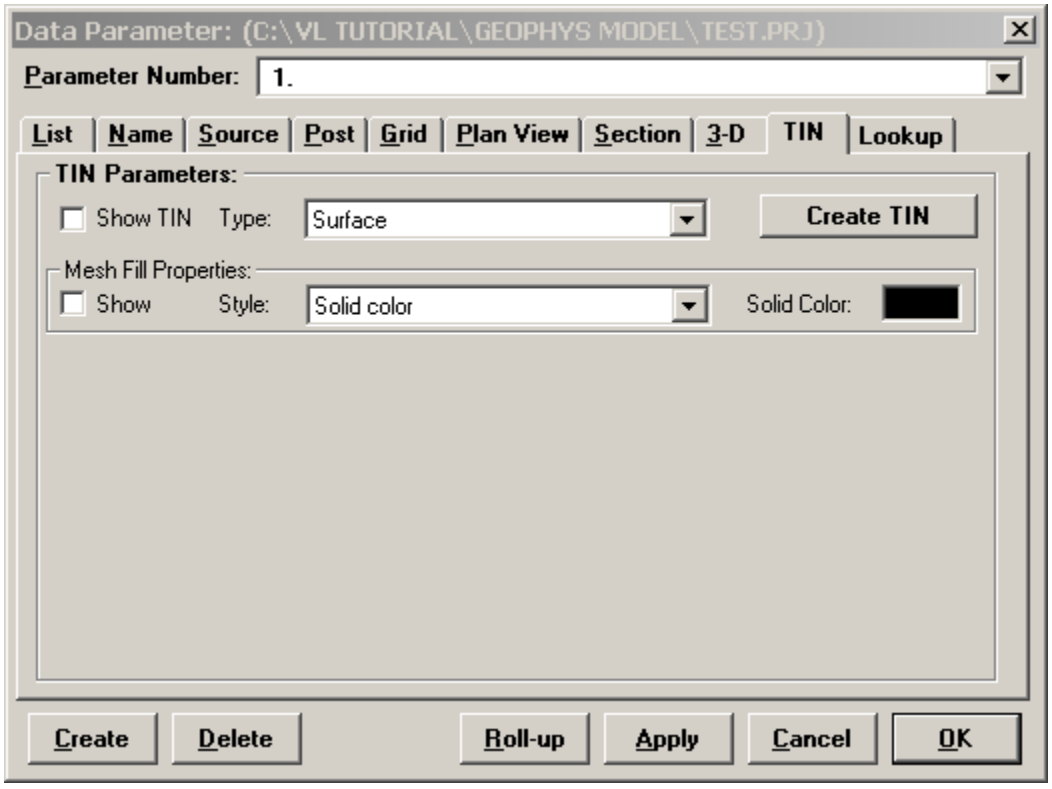
Create TIN: Generates the TIN surface.

Mesh Fill Properties

Show: Displays the TIN surface as a mesh.

Style: The surface can be displayed as either a **Solid color** or **Gradient color**.

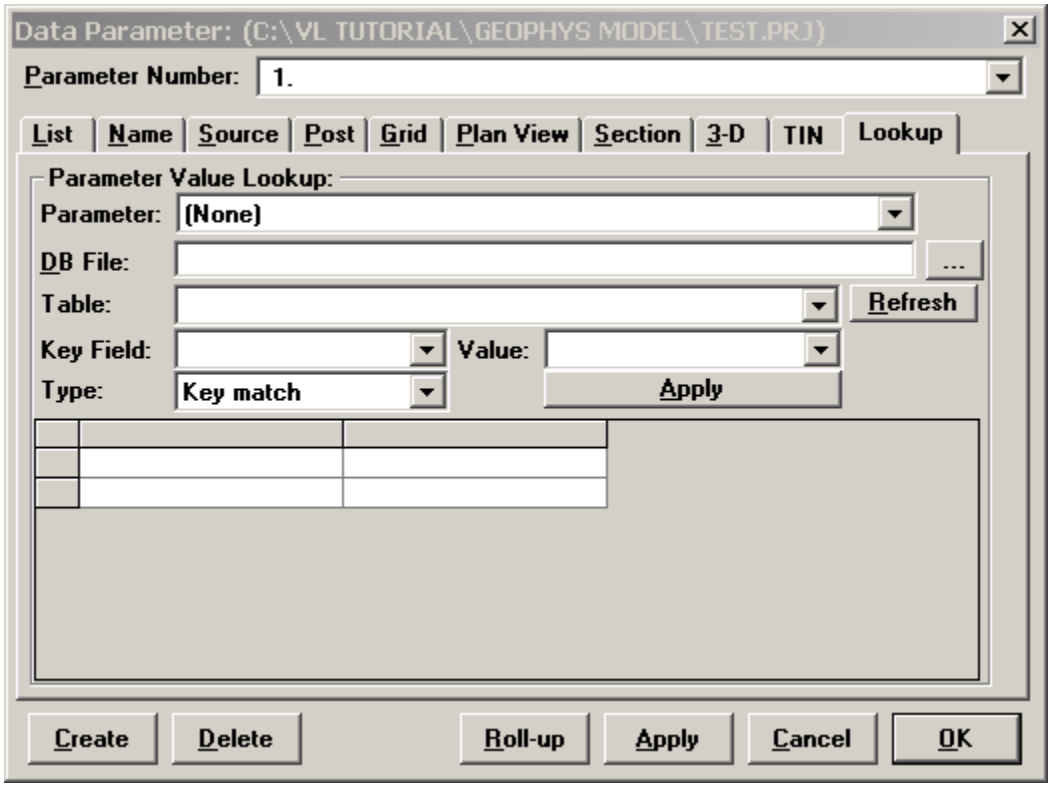
Solid Color: Choice of which solid color to display.



Data Parameter – TIN Tab.

Data Parameter: Lookup Tab

Allows the user to create a lookup tables for parameter values from previously assigned lookup codes, to parts of the grid.



Data Parameter – Lookup Tab.

Parameter: Select from the drop- down menu the Data Parameter.

DB File: Select the DB file or EXCEL spreadsheet.

Table: Select from the drop down-menu the appropriate table from the database. If the user has chosen an EXCEL sheet the Table options will appear as the EXCEL sheet name.

Refresh: Refreshes the data connection.

Key Field: User-defined lookup codes listed in the reference Data Parameter.

Value: Values as defined to the output grid (i.e., field name or column for assignment).

Type:

Key match: 1 to 1 match between the reference to the lookup.

Range to <: Allows for a range of values to be assigned based on the reference to the lookup.

> **Note:** For more information on the **Lookup** tab and associated applications please refer to the VIEWLOG reference manual.

Extra

Make VLBH from DB

Import ASCII BH list (N,B,BHName)

Modflow Menu

New

The **Modflow/*New*** function is used to reset all Modflow properties and start a new simulation.

Open

Modflow properties can be saved as *.mdf files. The **Modflow/*Open*** function is used to open an existing *.mdf file.

Close

The **Modflow/*Close*** function is used to close the *.mdf file that is currently open.

Save

The **Modflow/*Save*** function will save the current Modflow simulation properties into a *.mdf file.

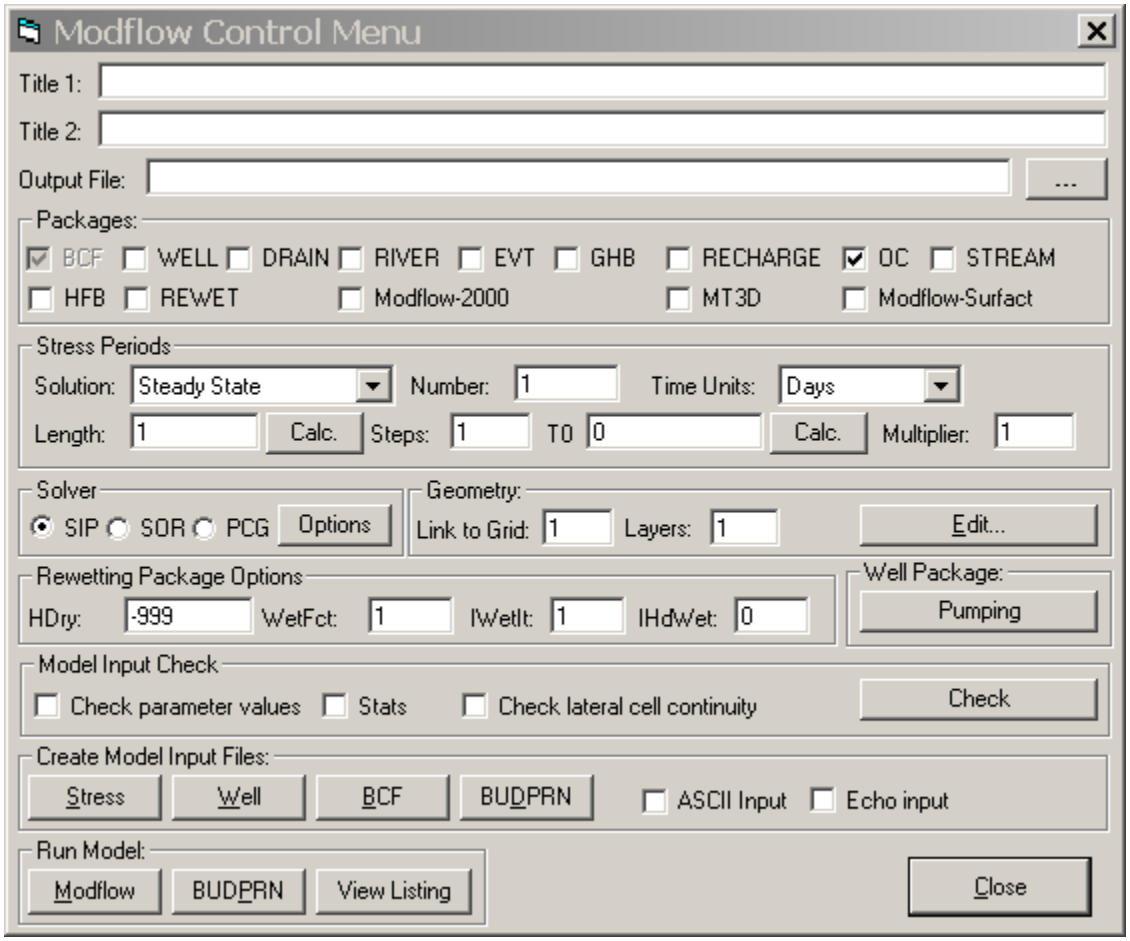
Save As

The **Modflow/*Save As*** function is used to save the current Modflow simulation properties into a new or different *.mdf file.

Import BAS/BSC File

The **Modflow/*Import BAS/BSC File*** option is used to import an existing Modflow BAS or BSC file.

Modflow Control



Modflow Control Menu.

The **Modflow Control Menu** is used to set up the Modflow simulation.

Title 1: This text box (Optional) contains a title for the model simulation.

Title 2: This text box (Optional) contains the second line of the title for the model simulation.

Output File: This text box contains the path and filename for the Modflow listing file. The button on the right-hand side will open a **File Open** window.

Packages:

These check boxes determine which Stress Packages are selected for the Modflow simulation. If a module is selected, the appropriate data must be provided.

BCF: Block-Centered Flow Package (selected automatically) (BCF file).

WELL: Well Package (WEL file).

DRAIN: Drain Package (DRN file).

RIVER: River Package (RIV file).

EVT: Evapotranspiration Package (EVT file).

GHB: General-Head Boundary Package (GHB file).

RECHARGE: Recharge Package (RCH file).

OC: Output Control Package (OC).

STREAM: Stream Package (STR file).

HFB: Horizontal Flow Barrier Package (HFB file).

REWET:

Modflow-2000:

MT3D: MT3D is a 3-D transport model for the simulation of advection-dispersion and chemical reactions of dissolved chemicals.

Modflow-Surfact: A version of Modflow that includes simulation of the unsaturated zone.

Stress Periods:

Solution: Allows the user to choose between a steady state and transient simulation.

Number: The number of stress periods for the simulation (Set to 1 for steady-state simulations).

Time Units: This drop-down menu allows the user to choose the time units printed in the model output.

> **Note:** Modflow requires that all data be provided in a consistent set of units. In other words, if transmissivity is specified in m^2/d, then recharge must be in m/d. The time units specified here do not affect model calculations.

Length: The length of the stress period. Set to 1 for steady-state simulations.

Calc. (1): This button will calculate the length of the time step, given values for **T_0**, **Steps**, and **Multiplier**.

Steps: The number of time steps per stress period. Set to 1 for steady-state simulations.

T_0: The initial size of the time step for each stress period. Set to 1 for steady-state simulations.

Calc. (2): This button will calculate the size of the initial time step, given values for **Length**, **Steps** and **Multiplier**.

Multiplier: The size of the time-step multiplier. Set to 1 for a constant time-step size and also for steady-state simulations. Should be set to a value between 1 and 1.2 to prevent the time step from growing too quickly.

Solver:

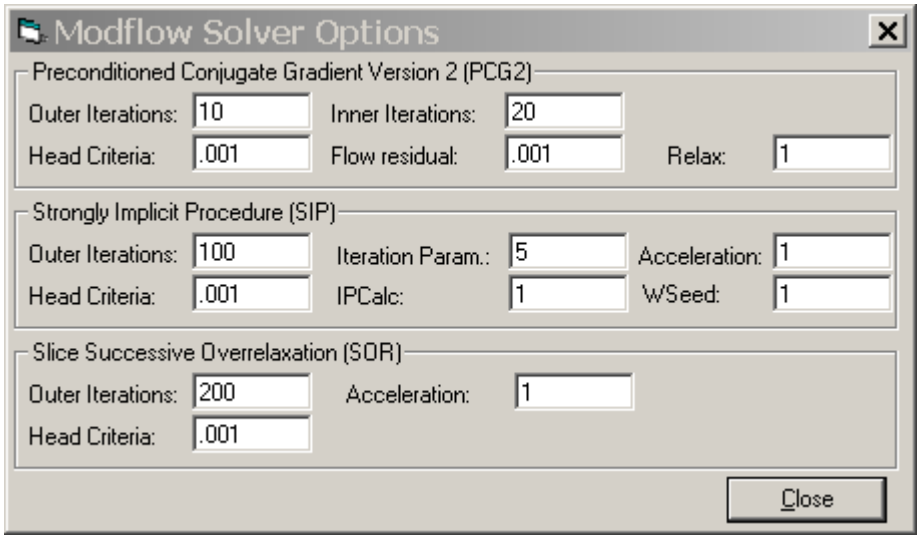
There are three solvers that can be used.

SIP: Strongly Implicit Procedure.

SOR: Slice-successive Overrelaxation Procedure.

PCG: Pre-conditioned Conjugate Gradient Solver.

Options:



Modflow Solver Options.

Outer Iterations (All): The maximum number of times through the iteration loop in one time step.

Inner Iterations (PCG): The maximum number of inner iterations. Using a larger number of inner iterations will help to speed up convergence.

Head Criteria (All): The criterion used by the model to determine whether the solution has converged. The maximum change in head between iterations must be less than this number in order for convergence to be reached.

Flow Residual (PCG): The criterion used by the PCG solver to determine whether the solution has converged. The maximum change in the residual between iterations must be less than this number

Relax/Acceleration (All): A factor used to speed up convergence between iterations. Usually set to 1 or slightly greater than 1. PCG may need the relaxation set to slightly less than 1 in some problems.

Iteration Parameters (SIP): Number of SIP iteration parameters. Five is usually enough but this can be increased to increase stability.

IPCalc (SIP): Flag that controls how the seed for calculating SIP iteration parameters will be calculated. If equal to 1, parameters will be calculated from model problem parameters. If set to 0, the value for **WSeed** will be used.

WSeed (SIP): Seed for calculating SIP iteration parameters. Used only if **IPCalc** is equal to 0.

Geometry:

Link to Grid: In this box, the user must specify which grid to use as the model grid.

Layers: The number of Modflow layers (This value cannot be changed here. To change add or remove layers, open the Modflow Layer Menu by hitting the **Edit** button.)

Edit: This button opens the **Modflow Layer Menu**, which can also be opened from the **Modflow/*Modflow Layer*** menu item.

Rewetting Package Options:

HDry:

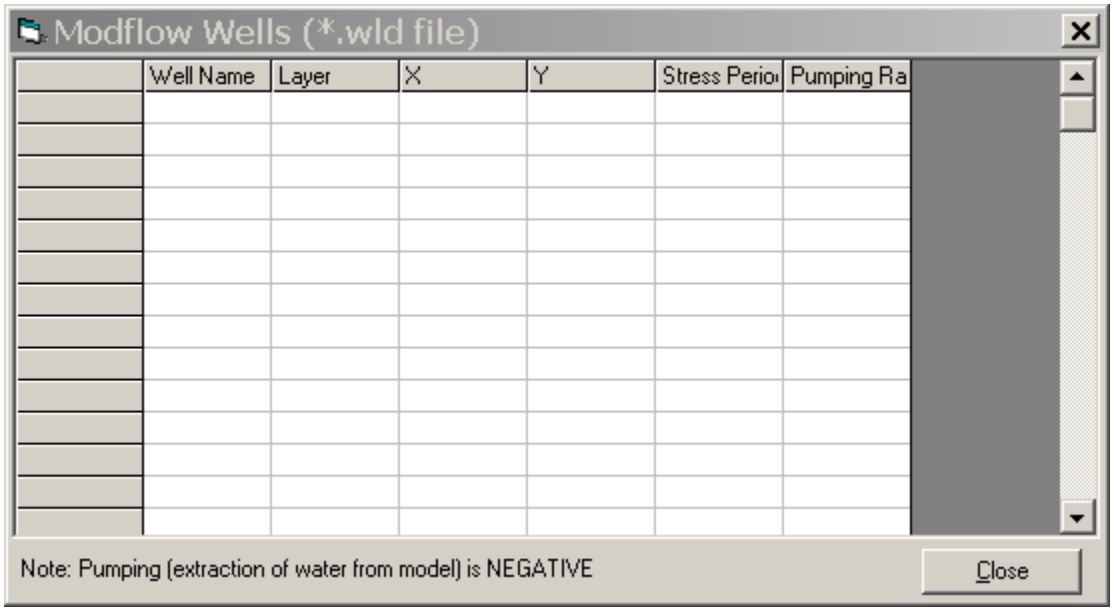
WetFct:

Iwetlt:

IhdWet:

Well Package:

Pumping: This button is used to input the name, location and pumping rate of Modflow pumping wells. When selected, the following window will appear:



Modflow Wells.

Model Input Check:

These options allow the user to perform simple checks of model parameters and layer geometry. Specifically, the function checks all active and constant head cells with the following options:

Check parameter values:

1. The thickness is less than a user-defined minimum
2. The base of the cell is below the top of the next layer
3. The initial head is below the base of the cell
4. The hydraulic conductivity is less than or equal to 0
5. The vertical conductance is less than or equal to 0.

Stats:

Check lateral cell continuity: Check to see if cell continuity is preserved (i.e., whether the top of an adjacent cell is below the base of the current cell)

Create Model Input Files:

Stress: This button will create the files for the different stress packages (i.e., *.RIV, *.DRN, *.GHB, *.STR).

Well: This button will create the *.WEL file for the well package.

BCF: This button creates the *.BAS, *.BCF, and *.DEF files. The *.DEF file contains information needed by the VIEWLOG version of Modflow to open the required input files. The *.RCH, *.EVT, and *.OC files will be created if those options are checked in the **Packages** section. A *.SIP, *.SOR, or *.PCG file will be created, depending on which solver is selected.

BUDPRN: This button creates the *.BUD file, which is needed as input to the VIEWLOG Systems water budget and velocity vector post-processing program. This program reads the binary flux file and creates VIEWLOG compatible files that can be used to view and analyze model results.

ASCII Input: Checking this box causes the array data to be placed in the input data files (e.g., the *.BAS or *.BCF file) in ASCII format. The default is to have the input data files point to the direct-access binary files.

Echo Input: Checking this box sets the print flag (IPRN) on the array reader control card to a positive number. This is useful as a check whether all array data have been specified correctly. The default is to set IPRN to a negative value to suppress printout of the arrays.

Run Model:

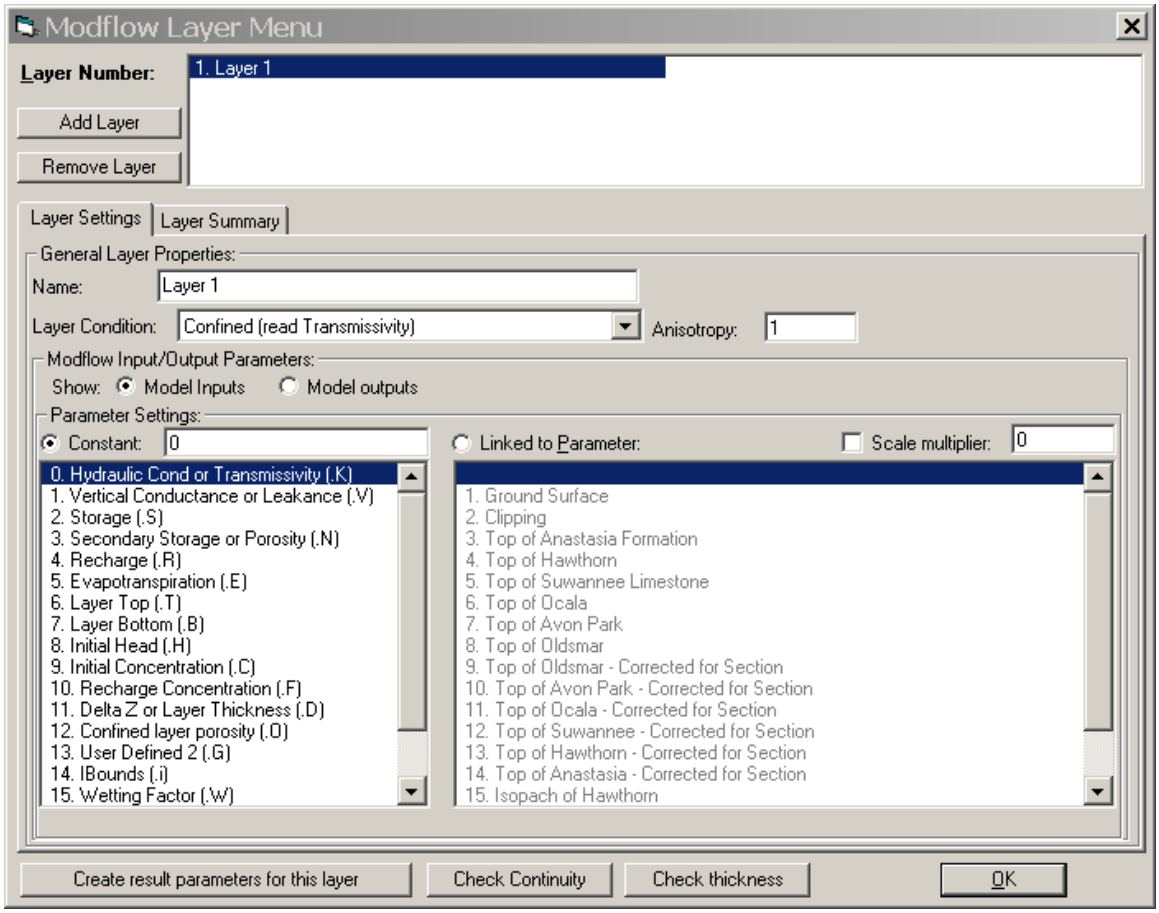
Modflow: This runs the VIEWLOG version of the Modflow code.

BUDPRN: This runs the VIEWLOG water budget and velocity vector post-processing program. This program reads the binary flux file and creates VIEWLOG compatible files that can be used to view and analyze model results.

View Listing: This opens the Modflow listing file in Windows Notepad.

Modflow Layer

The Modflow Layer menu is used to assign Modflow layers, layer properties, boundary conditions and Modflow information. These Modflow properties can be related to a VIEWLOG Data Parameter, or set as constant values.



Modflow Layer Menu.

Add Layer: Allows the user to add a new layer (the new layer will be added after the selected layer).

Remove Layer: This command deletes the selected layer.

Layer Settings Tab

Name: Allows the user to specify a name for the current layer.

Layer Condition: Allows the user to specify the layer-type from a list of four available Modflow types:

1. **Confined (read Transmissivity)**: This is the typical setting for a confined aquifer. The TRAN input array containing transmissivity values will be read. However, aquifer geometry (layer top and bottom) will not be used in the model.
2. **Unconfined (read K)**: This is the typical setting for an unconfined (water-table) aquifer. The HY input array containing hydraulic conductivity values will be read. Only the layer bottom will be used.
3. **Confined/Unconfined (read Transmissivity)**: This is one option for an aquifer that may convert from confined to unconfined conditions if the heads drop below the top of the aquifer. The change in saturated thickness is assumed to be small and the

TRAN input array containing transmissivity values will be read. Only the layer top will be used.

4. **Confined/Unconfined (read K)**: This is a second option for an aquifer that may convert from confined to unconfined conditions if the heads drop below the top of the aquifer. The change in saturated thickness is assumed to be significant and the HY input array containing hydraulic conductivity values will be read. Both the layer top and bottom will be used in calculations.

Anisotropy: Allows the user to specify an anisotropy value for the current layer. The factor is defined as the ratio of the K or T along a column to the K or T along the row. For example, if Ky is half the value of Kx, a value of 0.5 should be specified. This value is applied over the entire layer and it is assumed that the principle axes of anisotropy are aligned with the row/column axis.

Model Input/Output Parameters:

Show: Model Inputs/Model outputs: The user must select either model inputs or outputs to be shown in the list that follows.

Parameter Settings:

Constant: Selecting this option indicates that a constant value is to be used for the property instead of an array of property values. The constant property value is entered into the text box.

Linked to Parameter: Selecting this option indicates that a Data Parameter will be linked to the input data array. The user selects the appropriate Data Parameter from the displayed list. The advantage of this method is that multiple Data Parameters can be defined (e.g., different arrays with different distributions of transmissivity values) and saved. The input array can be linked to a different Data Parameter for each model run and model results can then be compared.

Scale Multiplier:

Create result parameters for this layer: This button automatically generates a set of Data Parameters linked to typical output from Modflow and BUDPRN. The default file names follow an older convention where:

1. *.1xx = direct access binary head file for Layer xx
2. *.2xx = direct access binary drawdown file for Layer xx
3. *.3xx = recharge flux file for Layer xx generated by BUDPRN
4. *.4xx = ET flux file for Layer xx generated by BUDPRN
5. *.5xx = river/stream flux file for Layer xx
6. *.6xx = drain flux file for Layer xx
7. *.7xx = GHB flux file for Layer xx
8. *.8xx =Well flux file for Layer xx
9. *.9xx = Constant head flux file for Layer xx
10. *.0xx = vertical leakage flux file for Layer xx.

Check Continuity: This button checks all active and constant head cells in the layer to determine whether cell continuity is preserved (i.e., whether the top of an adjacent cell is below the base of the current cell).

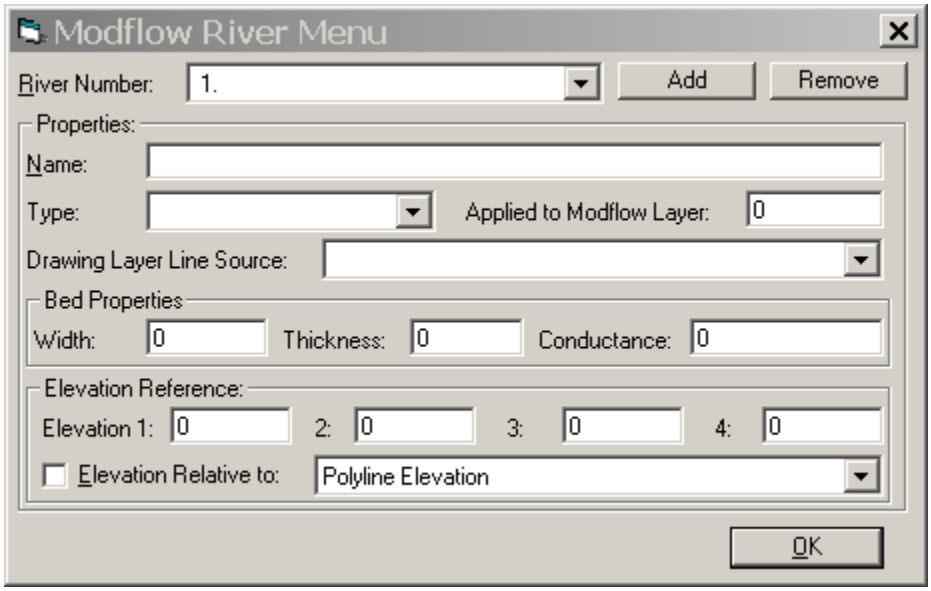
Check thickness: This button checks all active and constant head cells in the selected layer to determine whether cell thickness is less than a user-defined minimum.

Layer Summary Tab

The **Layer Summary** tab provides a list of the Modflow parameters that are either constant or based on a Data Parameter, as specified above.

Calculate input parameter statistics: Checking this box will show information such as the number of cells, and min/max/average values of the displayed Modflow parameters.

River/Drain Properties



Modflow River Menu.

River Number: This box allows the user to select the river (drain or GHB) data set to edit.

Add: This button allows the user to add a new river. All properties from the selected river will be copied to the new river.

Remove: This button deletes the selected river.

Properties

Name: Allows the user to specify the current river name.

Type: Selects the layer type from the three standard Modflow river types. Specifically, these are:

1. **River:** A head-dependent source/sink term that represents a reach of river. Leakage to or from the river is proportional to the difference between the head in the aquifer and the river stage when the aquifer head is above the base of the riverbed. Leakage from the river is proportional to the difference between the river stage and riverbed elevation when the head in the aquifer is below the base of the riverbed.
2. **Drain Cell:** A head-dependent sink term that represents a reach of a groundwater drain. Leakage is proportional to the difference between the aquifer head and the drain control elevation of the drain when the aquifer head is above the drain elevation. No leakage occurs when the aquifer head is below the drain elevation.
3. **General Head Boundary (GHB):** A head-dependent source/sink term that represents leakage from some external source of water. Leakage to or from a GHB

cell is proportional to the difference between the head in the aquifer and the head at the boundary.

Applied to Modflow Layer: This text box specifies the layer number to which leakage will be applied. The head from that layer will be used to calculate the rate of leakage.

Drawing Layer Line Source: This box allows the user to select the layer containing the river polylines. All rivers represented by polylines on the layer will be assumed to have identical properties.

Bed Properties:

Width: The width of the riverbed. This is assumed to approximate the wetted perimeter.

Thickness: The thickness of the riverbed.

Conductance: Allows the user to specify to hydraulic conductivity of the riverbed. Conductance will be calculated as hydraulic conductivity of the bed (K') divided by its thickness (B') and multiplied by the width and length of the river reach within the grid cell. VIEWLOG will automatically determine the length of a river segment within each cell.

Elevation Reference

Elevation 1: River stage for rivers, drain controlling elevation for drains, boundary head for GHB cells, or stream stage for stream cells. The text box contains either a constant elevation value or an offset from the specified reference elevation. For example, if the drain control is set to 1 meter below the interpolated topography for that cell, a value of –1.0 should be specified.

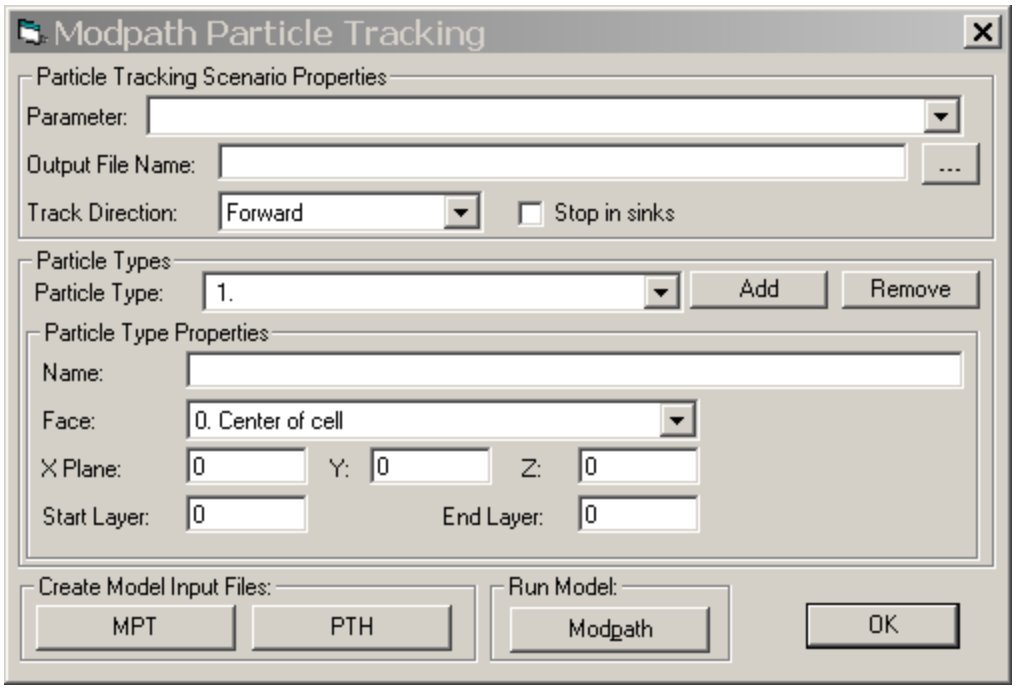
Elevation 2: River bottom elevation for rivers. Streambed bottom elevation for streams. Text box contains either a constant elevation value or an offset from the specified reference elevation.

Elevation 3: River bottom elevation for rivers. Streambed top elevation for streams. Text box contains either a constant elevation value or an offset from the specified reference elevation.

Elevation 4: Not used.

Elevation Relative to: If selected, the stage is set relative to the polyline elevation or to any of the available Data Parameter values for the cell (e.g., land surface topography or layer base).

Particle Tracking



Modpath Particle Tracking.

Particle Tracking Scenario Properties

Parameter: This box allows the user to select the Data Parameter that contains the starting point information for the particles.

Output File Name: This text box contains the path and file name for the Modpath listing file. The button on the right-hand side will open a **File Open** window.

Track Direction: This allows the user to select whether particles are to be tracked along the direction of groundwater flow from the point of origin to a discharge point (**Forward**) or backwards from the initial position to the point of origin (**Reverse**).

Stop in sinks: This check box allows the user to select whether particles are assumed to be captured by a cell containing any sink (e.g., a well or river cell) or if particles are tracked beyond those cells to a model boundary.

Particle Types

Particle Type: The drop-down list box allows the user to select the particle type to edit.

Add: This button allows the user to add a new particle types after the selected type. All properties from the selected particle type will be copied to the new type.

Remove: This button deletes the selected particle type.

Particle Type Properties

Name: Allows the user to specify and edit the particle type name.

Face: Drop down box allows the user to select the face of the cell on which to place particles. Particles can also start in the center of the cell. Various combinations of faces can also be selected, such as all faces, all sides, or top and bottom only.

X-Plane: These text boxes allow the user to specify the number of points placed on each face or in the center of the cell. For example, if the East Face is selected, setting **Y** equal to 3 and **Z** equal to 5 will cause 15 points (3 in each of 5 north-south rows). If center of cell is selected, selecting a **X** equal to 2, **Y** equal to 3 and **Z** equal to 5 will cause 30 points to be distributed evenly within the cell.

Start Layer: Specifies the first layer on which to place the particles. This allows creation of vertical strings of particles without having to define separate particle types for each layer.

End Layer: Specifies the last layer on which to place the particles. For example, Particle Type 2 would have the start and end layer equal to 2.

Create Model Input Files

MPT: This button creates the Modpath Control *.MPT file. The control file combines much of the general model information present in the Modflow *.BAS and *.BCF files. The file definition *.FIL file is also created and it contains the names of the files and FORTRAN unit numbers needed to run Modpath.

PTH: This command button creates the *.PTH file. The Modpath program is assumed to run in batch mode, rather than interactively. The *.PTH file is an ASCII file.

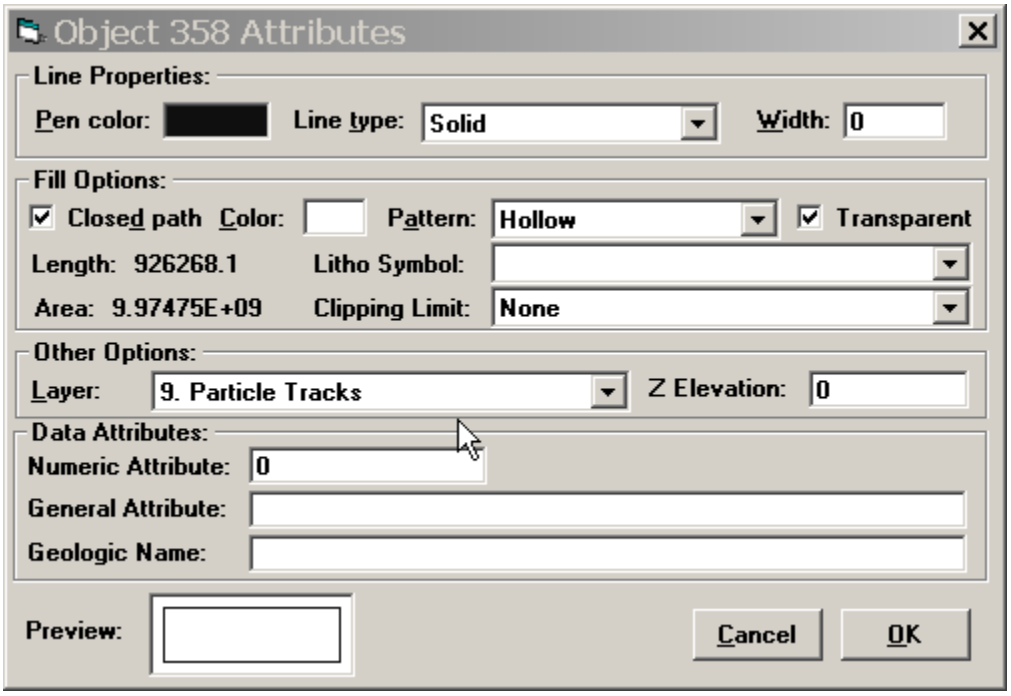
Run Model

Modpath: This runs the VIEWLOG version of the Modpath post-processor code. The ASCII output files, PATHLINE and ENDPOINT, will be generated. The PATHLINE file can get quite large if many particles are used and the grid is very refined. A direct-access binary output file is also generated that is more compact. This *.PLN file is read by VIEWLOG to display the pathlines. The existing *.PLN file should be erased before each model run. The *.PLN files can be renamed to archive results of different model runs.

Link Pathlines

The **Modflow/*Link Pathlines*** command is called after the Modpath model has been run. A file import open window will be opened to allow the user to select a *.PLN file. VIEWLOG will read the pathline file and create a map object consisting of all pathlines. The pathlines are placed automatically on the current drawing layer.

> **Note:** It is recommended that you create a new layer to store the particle tracks before linking and then set that layer to be the current. After linking, you can select the particle tracks by using the **Edit/Advanced Select/**Select Layer command. Line attributes, such as color and width can be changed by editing the line properties (**Edit/**Line Attributes, or **Ctrl+A**). All pathlines are assigned the same properties.



Object Attributes.

Note: A special line attribute is available for particle pathlines that controls the time parameter for the path lines. Set **Max Time** to be equal to the magnitude of the time of travel that you want to display. Set to a large number (e.g. $1x10^{11}$ seconds) to show the maximum travel distance for the path lines. The time unit (i.e., seconds or days) must be consistent with the Modflow input data.

Time of Travel…

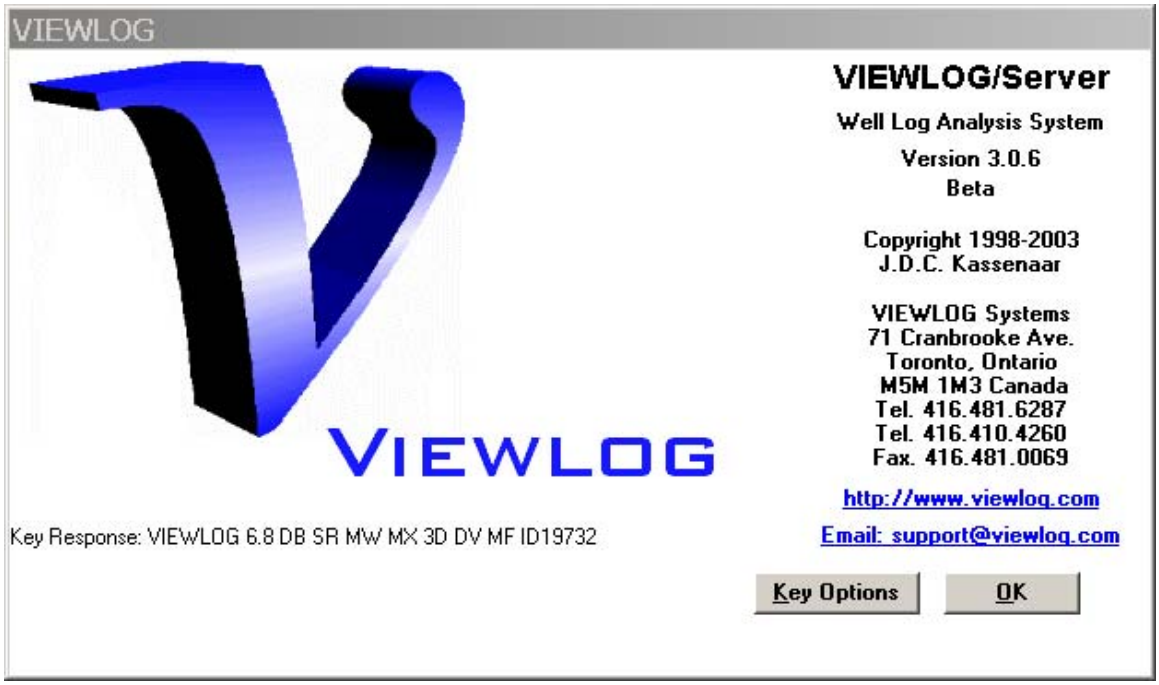
Options Menu

Lithology Symbol Editor

Please refer to Lithology Symbol Editor, in the Tools menu.

About VIEWLOG

In the Map Editor, the **Options/*About VIEWLOG*** dialog box displays the VIEWLOG copyright information, contact address (including e-mail) and logo. The **Key Response** is shown in the lower portion of the window. This code will be required when contacting the authors for upgrades.



VIEWLOG Title Screen.

Window Menu

Cascade

The **Window/*Cascade*** function arranges all windows in an overlapping manner, beginning in the upper left corner of the parent window.

Tile Horizontal

In the Map Editor, the **Window/*Tile Horizontal*** function can be used to arrange all windows in horizontal panels within the parent window. For example, when editing two HDR files, the **Window/*Tile Horizontal*** command will split the screen horizontally in the center and place one log window above the other.

Tile Vertical

In the Map Editor, the **Window/*Tile Vertical*** function can be used to arrange all windows in vertical panels within the parent window. For example, when editing two HDR files, the **Tile Vertical** command will split the screen vertically in the center and place the two log windows side by side.

Arrange Icons

The **Window/*Arrange Icons*** command can be used to arrange the icons along the bottom of the VIEWLOG parent form.

Help Menu

Contents

In the Map Editor, the **Help*/Contents*** function opens up User's Guide for VIEWLOG in a new window. Cross-references are included, which can be used to get help on specific features in VIEWLOG.

Index

Display a list of VIEWLOG menu commands

Search for Help On

Using Help

Display instructions on how to use help

VIEWLOG on the Web

http://www.viewlog.com/

About VIEWLOG

Please refer to About VIEWLOG in the Options Menu.

LOG EDITOR COMMANDS

File Menu

New Log File

The **File/*New Log File*** menu item can be used to create a new log data file (HDR file) in memory.

Open Log File

The **File/*Open Log File*** menu item is used to open an existing log data file (HDR extension).

Save

The **File/*Save*** menu saves the current file.

Save As

The **File/*Save As*** menu function allows the user to specify a new file name and directory into which the data will be written.

Save as Template HDR

Save the current file as a template header.

Close

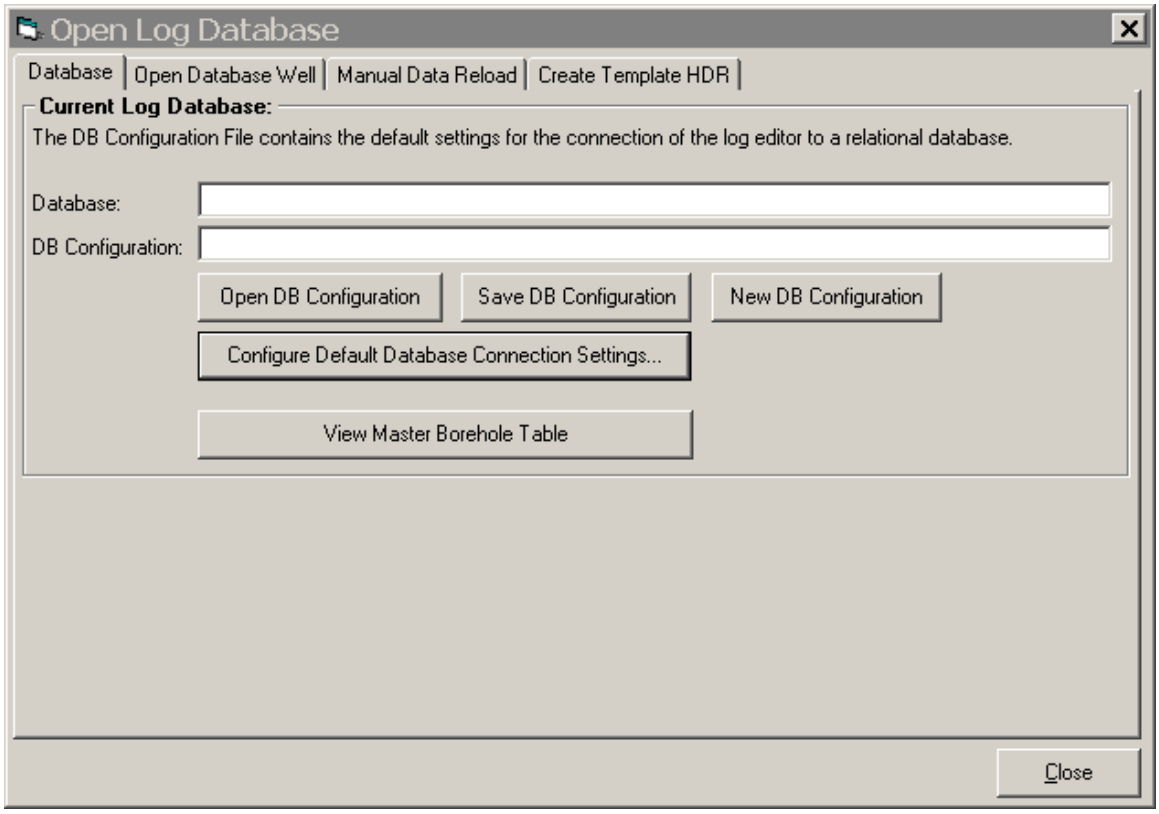
The **File/*Close*** function closes the window. It does not end the program. If the data in the window has changed, the program will request whether changes should be saved.

Open Log Database

This function allows for easy viewing of logs with user-defined templates as well as the **Log Database Connection Setup** menu (see below).

When selected, the **Open Log Database** window will appear. This window has four tabs, as described below.

Open Log Database: Database Tab



Open Log Database - Database Tab.

Current Log Database

Database: Shows the current database connection.

DB Configuration: Shows the current DB Configuration.

Open DB Configuration: Allows the user to change DB configurations.

Save DB Configuration: Saves the DB Configuration settings.

New DB Configuration: Clears the current settings from **Database** and **DB Configuration** on this menu.

> **Note:** This does not reconfigure the actual settings.

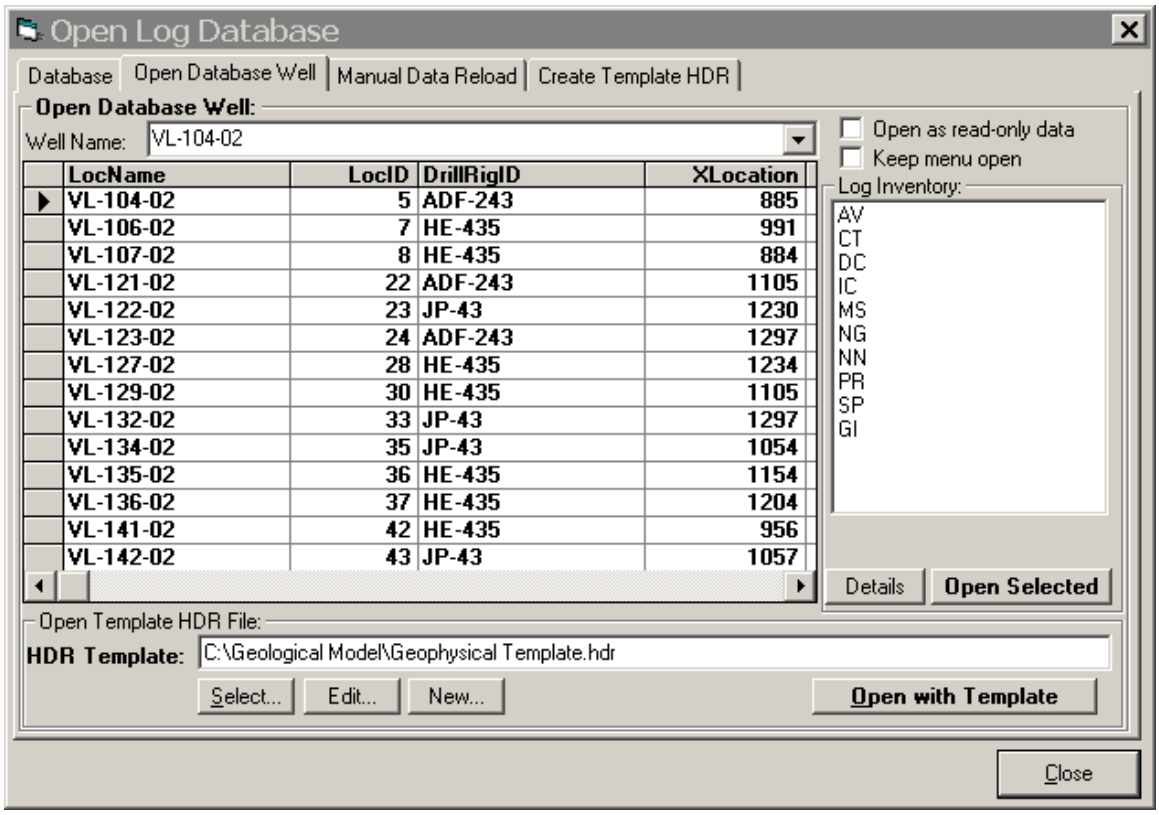
Configure Default Database Connection Settings:

This is one of the most important sections in configuring the Log Editor to the database. Viewing downhole geophysics is made easy by using the user defined log templates. The Multiwell Cross Plotting Module and the Auto Prediction module are also dependant on correct database connections in the next series of explanations. This button opens the Log Database Connection Setup window.

View Master Borehole Table: Displays the **Master Borehole Database Table** as defined in the configuration settings

Open Log Database: Open Database Wells Tab

This tab can be used to show a table that displays the well records.



Open Log Database - Open Database Well Tab.

Open Database Well:

Well Name: From the drop-down menu, select the well to be displayed.

Open as read-only data: When checked on the individual traces will be marked as Read-Only

Keep menu open: Keeps the **Open Log Database** menu open, after selecting a well to view.

Log Inventory

Details: Shows the available geophysical parameters in the database.

Open Selected: Opens the selected well.

Open Template HDR Files

HDR Template: Displays the VIEWLOG Template *.HDR file with which to view the selected well.

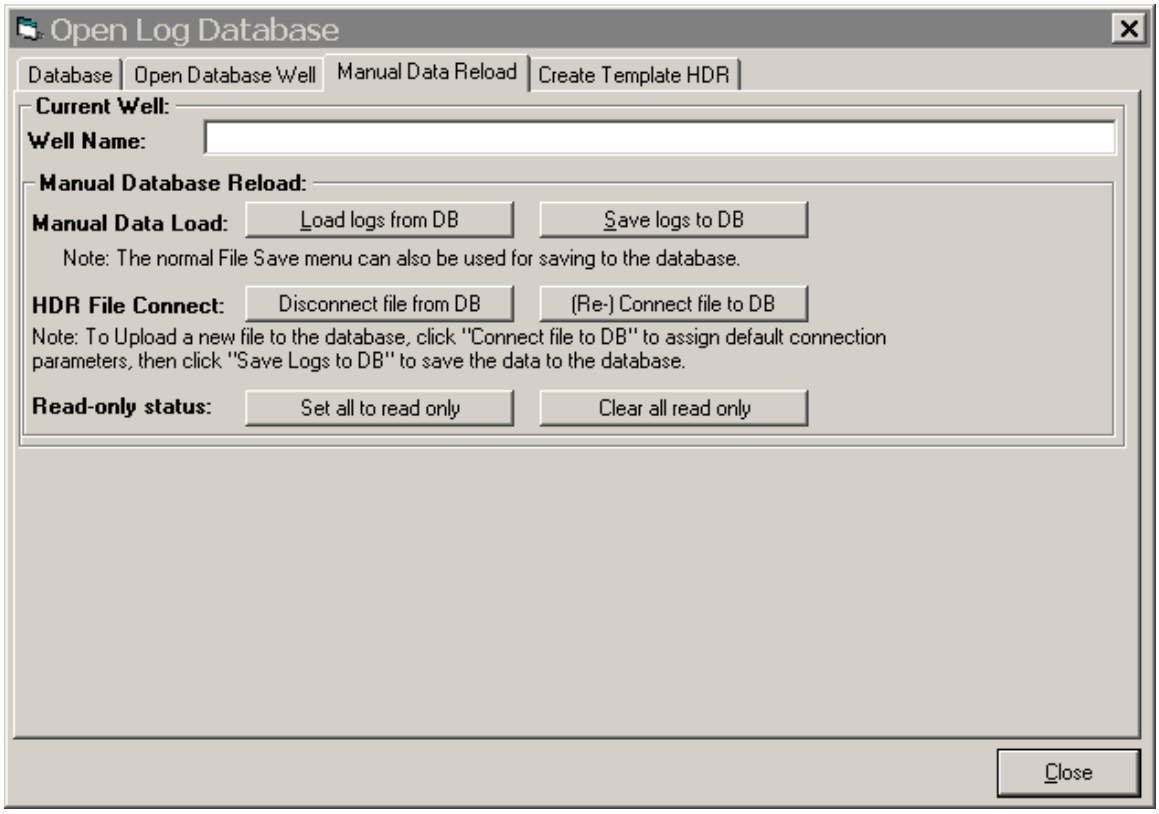
Select…: Selects the appropriate VIEWLOG *.HDR file.

Edit…: Edit the selected template.

New…: Creates a new file in the Log Editor to generate a new template.

Open with Template: Opens the selected log with the selected template.

Open Log Database: Manual Data Reload Tab


Open Log Database
Database
Open Database Well
Manual Data Reload
Create Template HDR
Current Well:
Well Name:
Manual Database Reload:
Manual Data Load:
Load logs from DB
Save logs to DB
Note: The normal File Save menu can also be used for saving to the database.
HDR File Connect:
Disconnect file from DB
(Re-) Connect file to DB
Note: To Upload a new file to the database, click "Connect file to DB" to assign default connection parameters, then click "Save Logs to DB" to save the data to the database.
Read-only status:
Set all to read only
Clear all read only
Close

Open Log Database - Manual Data Reload Tab.

Current Well

Well Name: Displays the current well name.

Manual Database Reload

Manual Data Load:

Load All Data: Load all the data for the defined well (above) in the tracks displayed in the log editor.

Save All Data: Save all the data for the defined well (above) in the tracks displayed in the log editor to the database.

> **Note:** Using this save feature will **overwrite** the existing data in the database.

HDR File Connect:

Disconnect file from DB: Disconnects the file from the database.

(Re-)connect file from DB: Reconnects the file to the database.

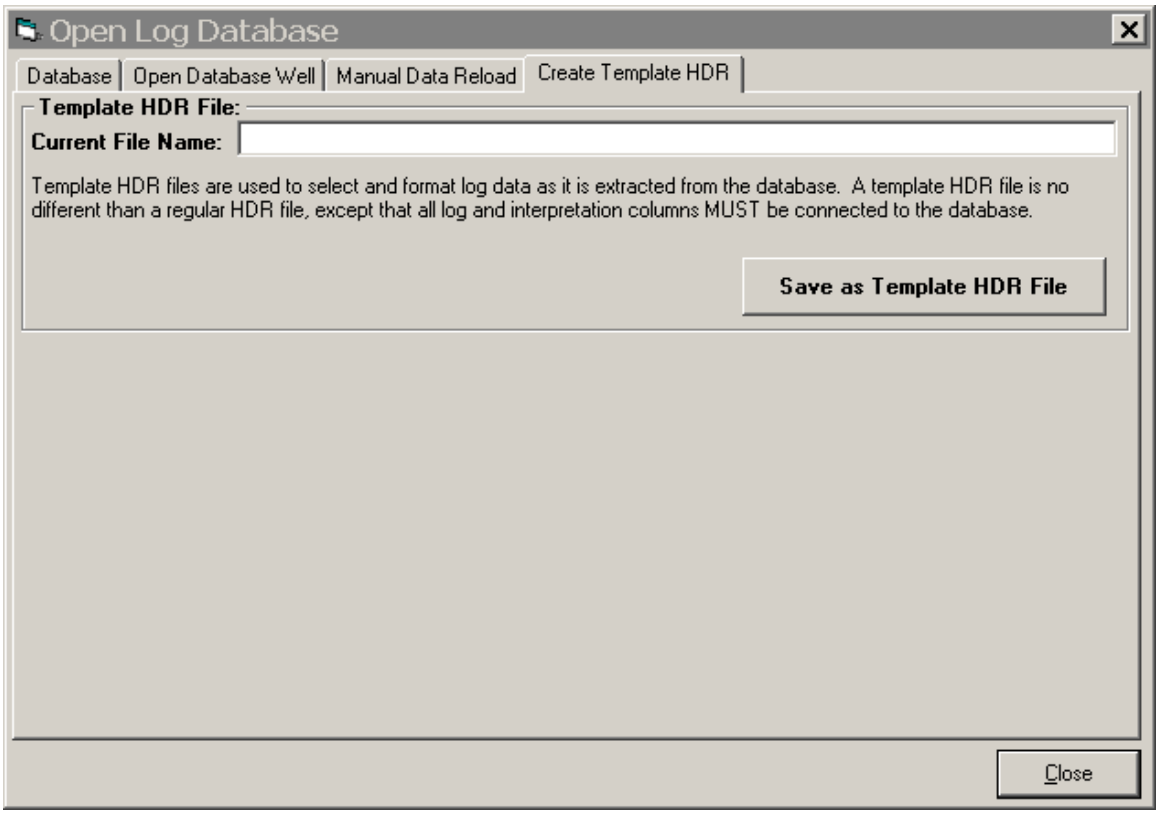
Disconnect All: Disconnects all the displayed traces to the database.

Read-Only Status:

Set all to read only: Set all the displayed traces to read only.

Clear all to read only: Unset all the displayed traces to read only.

Open Log Database: Create Template HDR Tab


Open Log Database
Database
Open Database Well
Manual Data Reload
Create Template HDR
Template HDR File:
Current File Name:
Template HDR files are used to select and format log data as it is extracted from the database. A template HDR file is no different than a regular HDR file, except that all log and interpretation columns MUST be connected to the database.
Save as Template HDR File
Close

Open Log Database - Create Template HDR Tab.

Template HDR File

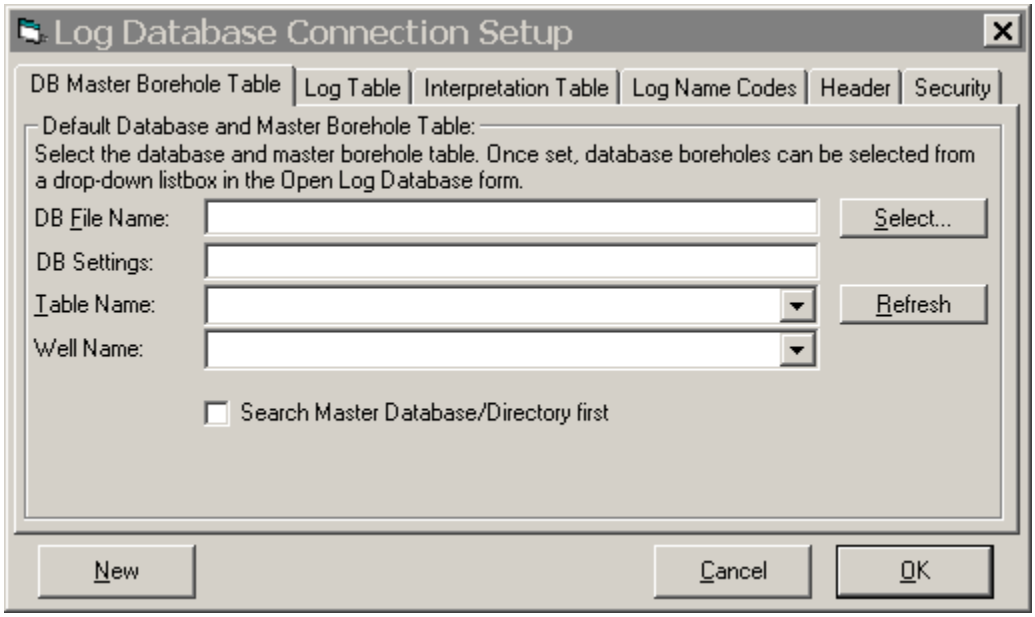
Current File Name: The name of the current Template HDR file.

Save as Template HDR File: Save the *.HDR files as a Template Header.

Log Database Connection Setup

Log Database Connection Setup: DB Master Borehole Table Tab

This tab is used to specify the Master DB file name, and the Master Borehole Table name.



Log Database Connection Setup – DB Master Borehole Table Tab.

Default Database and Master Borehole Table

DB File Name: Click on the **Select…** button and select the database that contains the information for this project.

DB Settings: Additional user-defined comments.

Table Name: By clicking on the **Refresh** button the drop down menu can be accessed to select the master table for the log information.

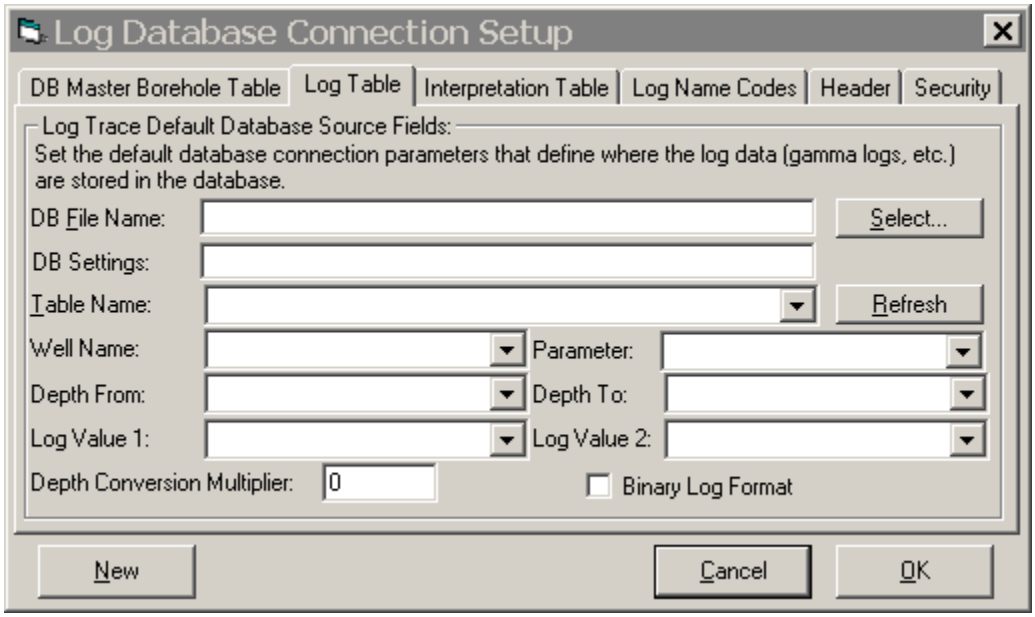
> **Note:** Typically the Master table holds the Well (Log) Name, Well (Log) ID, X, Y, and Z locations, Elevation, EOH, Drill Information, Logger information etc.

Well Name: By clicking on the drop down box, the well name can be accessed from the Master Table.

> **Note:** Typically the **Well Name** (or the Well ID) is the unique name for each individual log in the database. It is extremely important to insure that the unique name is selected in this section and all other subsequent sections.

Log Database Connection Setup: Log Table Tab

This tab is used to set the default database connection parameters that define where the log data are stored in the database.



Log Database Connection Setup – Log Table Tab.

Log Trace Default Database Source Fields

DB File Name: Click on the **Select…** button and select the database that contains the information for this project.

DB Settings: Additional user-defined comments.

Table Name: By clicking on the **Refresh** button, the drop-down menu can be accessed to select the log table where the downhole information is stored.

Well Name: By clicking on the drop-down box, the well name can be accessed from the log table.

Parameter: By clicking on the drop-down box, **Parameter** can be accessed (i.e., the actual physical property collected, e.g., Gamma, Neutron) from the log table.

Depth From: By clicking on the drop-down box, **Depth From** can be accessed from the log table.

Depth To: By clicking on the drop down box, **Depth To** can be accessed from the log table.

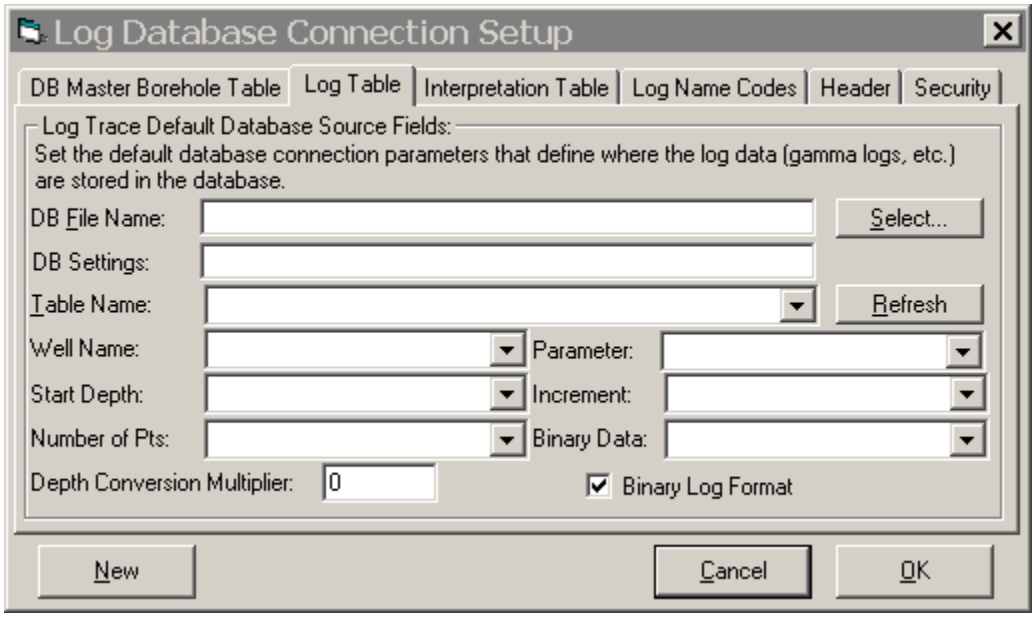
Log Value 1: By clicking on the drop-down box, **Log Value 1** can be accessed from the log table.

Log Value 2: By clicking on the drop-down box, **Log Value 2** can be accessed from the log table.

Depth Conversion Multiplier: The default value is 0, for no conversion of the depth data and value of –1 will convert the depth values to negative numbers.

Log Database Connection Setup: Log Table Tab for Binary Files

Checking the **Binary Log Format** box at the bottom of this screen, VIEWLOG will read Binary Blobs, which is an option for compacted storage of large amounts of downhole data. For more information on the formatting of the binary storage, please refer to the general topic reference in the main VIEWLOG Help Menu. If this option is selected, the **Log Table** tab will resemble that shown below, and the options will be slightly different.



Log Database Connection Setup – Log Table Tab for Binary Files.

Log Trace Default Database Source Fields

Start Depth: By clicking on the drop down arrow the starting depth can be accessed.

Increment: By clicking on the drop down arrow the increment can be accessed.

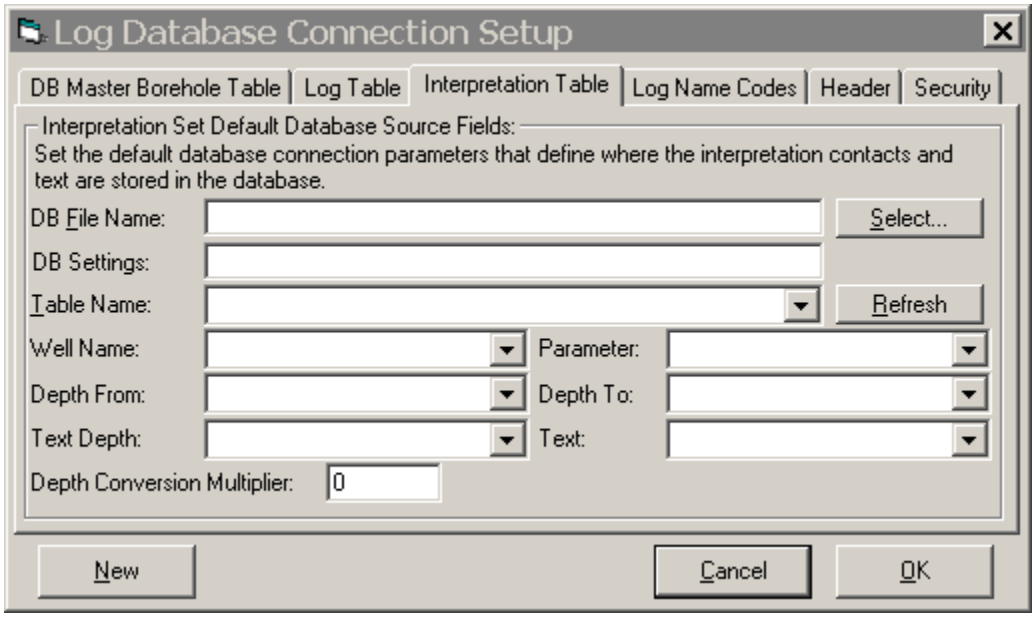
Number of Points: By clicking on the drop down arrow number of points can be accessed.

Binary Data: By clicking on the drop down arrow the binary blob can be accessed.

Depth Conversion Multiplier: The default value is 0, for no conversion of the start depth data and value of –1 will convert the start depth values to negative numbers.

Log Database Connection Setup: Interpretation Table Tab

This tab is used to set the default database connection parameters that define the interpretation contacts and text.



Log Database Connection Setup – Interpretation Table Tab.

Interpretation Set Default Database Source Fields

DB File Name: Click on the **Select…** button and select the database that contains the information for this project.

DB Settings: Additional user-defined comments.

Table Name: By clicking on the **Refresh** button the drop-down menu can be accessed to select the master table for the log information.

Well Name: By clicking on the drop-down box, the **Well Name** can be accessed from the Interpretation Table.

Parameter: By clicking on the drop-down box, the **Parameter** can be accessed from the Interpretation Table.

> **Note:** If there is only one type of interpretation in the database then this field can be left blank.

Depth From: By clicking on the drop-down box, the **Depth From** can be accessed from the Interpretation Table.

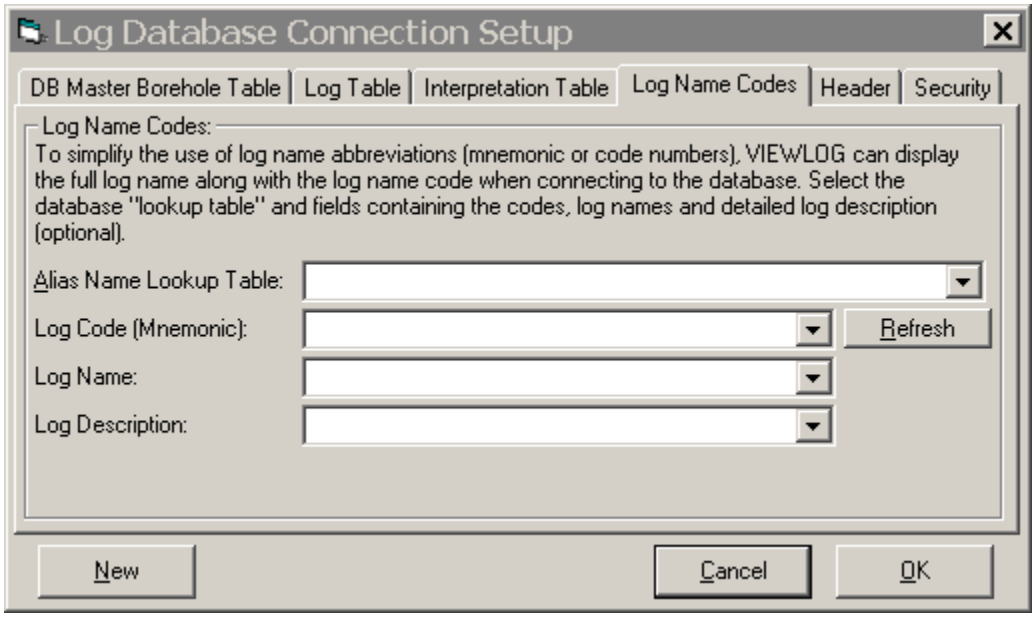
Depth To: By clicking on the drop down box, the **Depth To** can be accessed from the Interpretation Table.

Text Depth: By clicking on the drop down box, the **Text Depth** can be accessed from the Interpretation Table. **Text Depth** is reserved for comments that have been placed at a specific depth in the interpretation column of the log. (e.g., Water Table).

Text: By clicking on the drop down box, **Text** can be accessed from the Interpretation Table. This is the main interpretation text for the log.

Log Database Connection Setup: Log Name Codes Tab

To simplify the use of log name abbreviations (mnemonic or code numbers), VIEWLOG can display the full log name along with the log name code when connecting to the database. Select the database **Lookup Table** and fields containing the **Log Code**, **Log Name** and detailed **Log Description** (optional).


Log Database Connection Setup
DB Master Borehole Table
Log Table
Interpretation Table
Log Name Codes
Header
Security
Log Name Codes:
To simplify the use of log name abbreviations (mnemonic or code numbers), VIEWLOG can display the full log name along with the log name code when connecting to the database. Select the database "lookup table" and fields containing the codes, log names and detailed log description (optional).
Alias Name Lookup Table:
Log Code (Mnemonic):
Refresh
Log Name:
Log Description:
New
Cancel
OK

Log Database Connection Setup – Log Name Codes Tab.

Log Name Codes

Alias Name Lookup Table: User-defined lookup table.

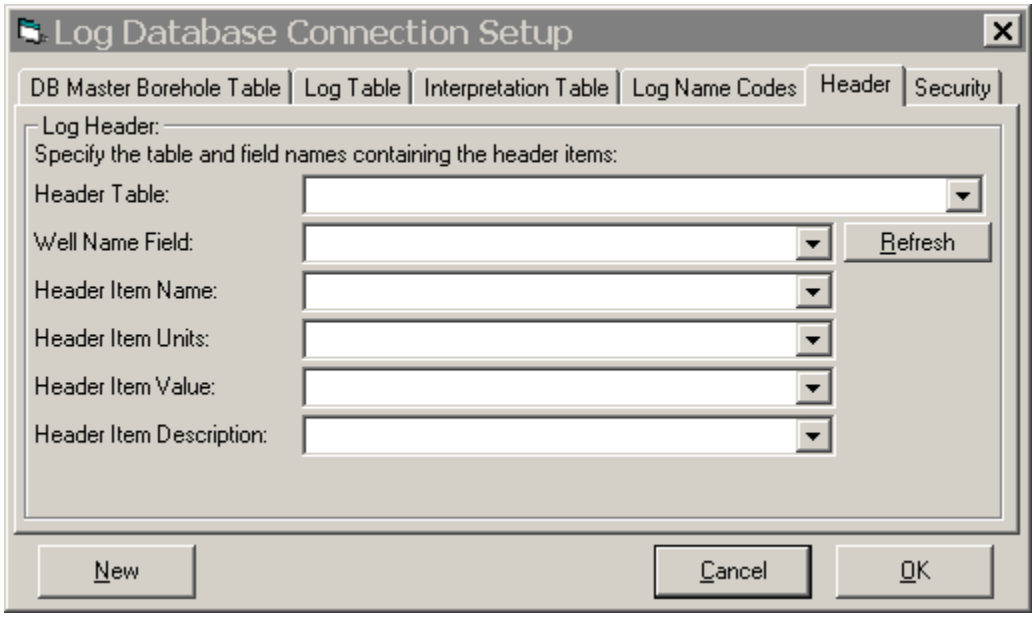
Log Name Code (Mnemonic): User-defined code for the log name stored within the lookup table

Log Name: Actual log name.

Log Description: Full description of the log.

Log Database Connection Setup: Header Tab

Specify the table and field names containing the header items.



Log Database Connection Setup – Header Tab.

Log Header

Header Table: The table in the defined database where the header information resides.

Well Name Filed: The field with the table name where the well name is located.

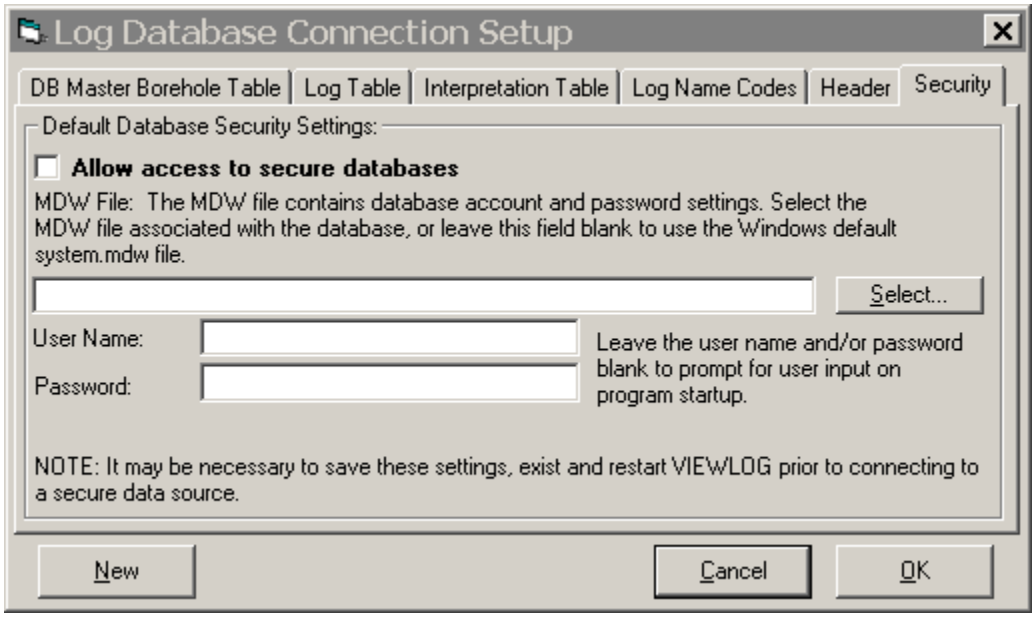
Header Item Name: The name of the header item display in the table.

Header Item Units: The units of the header item display in the table.

Header Item Value: The Value of the header item display in the table.

Header Item Description: A description of the header item display in the table.

Log Database Connection Setup: Security Tab


Log Database Connection Setup
DB Master Borehole Table
Log Table
Interpretation Table
Log Name Codes
Header
Security
Default Database Security Settings:
Allow access to secure databases
MDW File: The MDW file contains database account and password settings. Select the MDW file associated with the database, or leave this field blank to use the Windows default system.mdw file.
Select...
User Name:
Password:
Leave the user name and/or password blank to prompt for user input on program startup.
NOTE: It may be necessary to save these settings, exist and restart VIEWLOG prior to connecting to a secure data source.
New
Cancel
OK

Log Database Connection Setup – Security Tab.

Default Database Security Settings

Allow access to secure database: When checked, user can access to secure database, when the **User Name** and **Password** are selected. The MDW File contains database account and password settings. Selected the WBM file associated with the database, or leave this field blank to use the Windows default system *.MWD file.

Import

Import File Format: From the drop down menu will show the available file format to choose from including:

1. VIEWLOG *.HDR
2. Log ASCII Standard (LAS) version 1, 2 or 3
3. Generic ASCII files
4. Robertson Geologging
5. AUSLOG
6. Mount Sopris
7. Century

File Extension: Predefined file extensions.

Selected File (s): Displays the selected files to import or upload in the display window.

Remove files(s): Removes files to be imported or uploaded from the display window.

Import to HDR File(s):

In the Log Editor, the **File/*Import*** option provides access to a range of log data import functions. If the **Import** function is selected while editing an existing log file, the imported logs are merged into the current file. Select the **File/*New*** menu item to create a blank log header if the results of the import are to be stored in a new HDR file.

Merge selected files: Merges the selected files.

Add source file name to log name: Will add the source file name to the log trace.

Import: Imports the selected files to the Log Editor.

Upload to External Database:

VIEWLOG gives the user the ability through this function to bulk upload wells to the database.

Append well names to master borehole table: Appends the well name to the Master borehole table.

Upload log data: Uploads the log data to the defined table set in the DB Configuration file, see Open Log Database.

Upload header details: Will upload the header details to the defined table in the DB Configuration file. Usually used for LAS files.

Configure DB: Open the Log Database Connection Setup window.

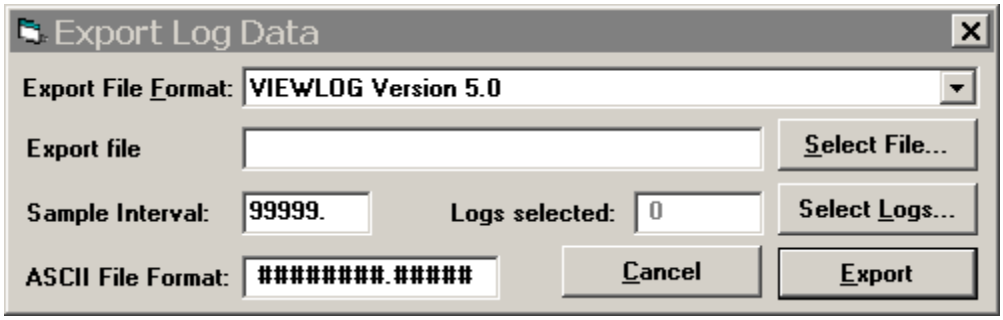
Upload: Uploads files to the database.

> **Note:** Uploading logs to the database via this menu option will **Append** logs to the database tables.

Export

In the Log Editor, the **File/*Export*** menu item provides access to the VIEWLOG log data export function. There are two export options in the Log Editor:

Export Log Data



Export Log Data.

Export File Format: The user can specify one of the following formats for exporting the log data:

1. VIEWLOG Version 5.0
2. VIEWLOG Version 4.5

3. Log ASCII Standard Version 1.2 (LAS)
4. Log ASCII Standard Version 2.0 (LAS)
5. Generic ASCII File
6. Lotus 123 Version 1 or 2

Export File: The file to which the log data is to be exported. The **Select File** button can be used to select an existing file.

Sample Interval: The sample interval for the exported log data.

Logs Selected: This box lists the number of logs selected for export, and cannot be changed by the user.

Select Logs: This box will open a **Select Logs** window, which allows the user to select the desired logs for export. The user can use the **Shift-click** and **Ctrl-click** options to select or unselect multiple logs from the list.

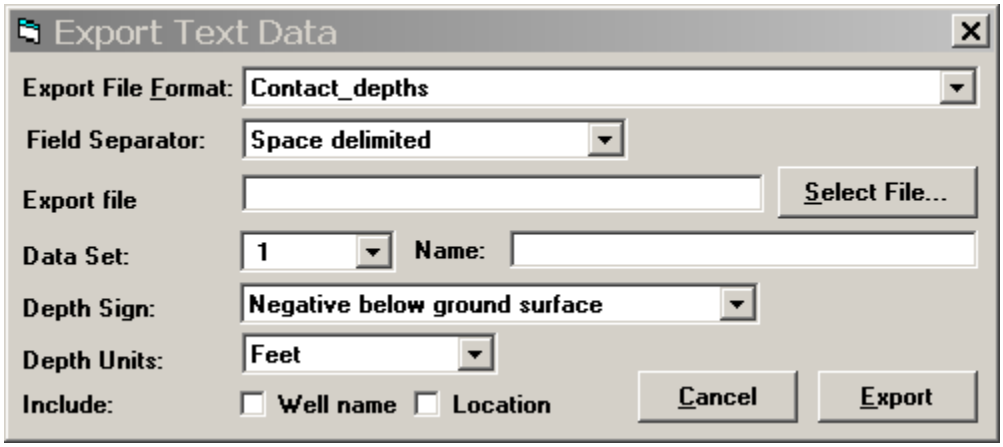
ASCII File Format: This box is used to specify the numeric format for the log data

Cancel: This button cancels the log data export.

Export: This button performs the file export.

Export Text Data

In the Log Editor, the **File/*Export*** menu item, log data can also be exported as text.



Export Text Data

Export File Format: The user can select one of the following options:

1. Contact depths
2. Contact Depth From/Contact Depth To
3. Text depth/Text string
4. Contact Depth To/Text string
5. From Depth/To Depth/Text string

Field Separator: The user can select how the text is separated from one of (1) space, (2) comma, or (3) tab.

Export file: The file to which the log data is to be exported. The **Select File** button can be used to select an existing file.

Data Set:

Name:

Depth Sign: The user can select either **Negative** or **Positive below ground surface**.

Depth Units: Either Feet or **Meters**.

Include:

Well name:

Location

Cancel: This button cancels export.

Export: This button performs the file export.

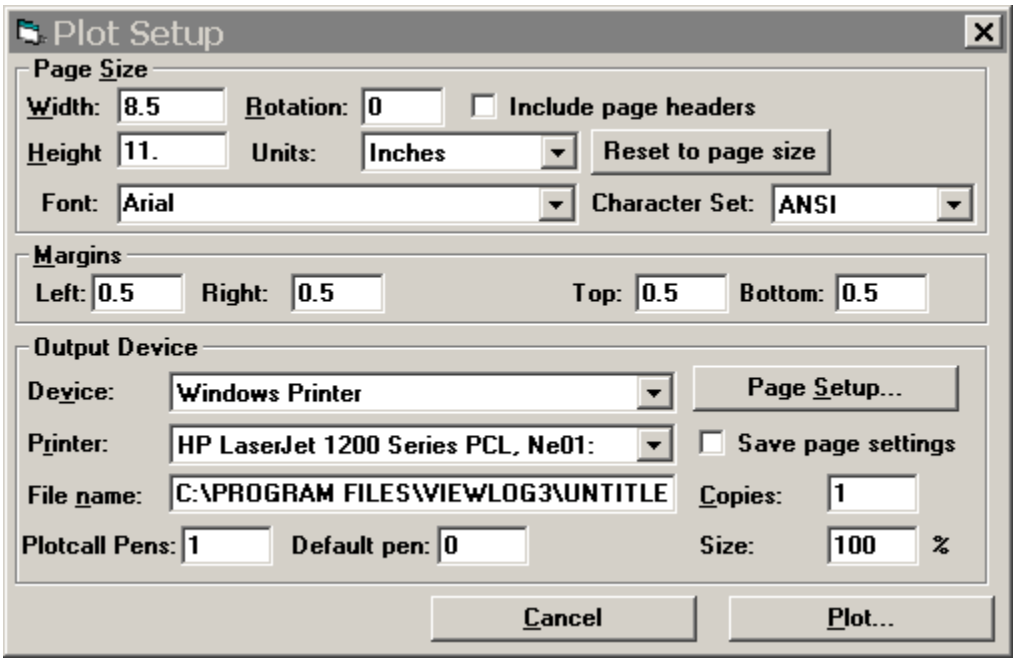
Multi-Well Log Analysis

In the Log Editor, the **File/*Multi-Well Log Analysis*** menu item loads the **Multi-Well Analysis Plot** window, which allows the user to create a multi-well plot. See Multi-Well Window Commands.

Print

In the Log Editor, the **File/*Print*** menu item loads the **Plot Setup** window, which is used to create output on paper, and export images to another format.

The **Plot Setup** dialog box is shown below.



Plot Setup.

Page Size

Plot Width: This parameter controls the width of the plot. The plot width is the total width, in inches, of all the columns, including the left and right margins.

Plot Height: This parameter controls the overall height of the plot. The plot length includes the top and bottom margins, header text and log column length.

Rotation: This parameter controls the angle of rotation of the plot on the output page.

Reset to Page Size: This parameter controls the reset calculation: for example, if the plot width is set to 8.5 inches, and the **Reset to page size** function is selected, the program will calculate track spacings and text sizes for a width of 8.5 inches.

Units: Page size can be specified in inches or cm.

Font: The user can select the font that will be used for titles, labels and axes.

Margins

The **Left**, **Right**, **Top** and **Bottom** margins of the page.

Output Device Options

Device:: Enter the output device or image export file type. Devices include:

Windows Printer: Output to the default windows printer.

Windows Metafile: Output to a MS Windows Metafile.

VIEWLOG Drawing (as WMF): Used to convert the output into the Map Editor.

VIEWLOG Drawing: Not yet supported - use VIEWLOG Drawing (as WMF).

AutoCAD DXF file: Output to DXF format for AutoCAD.

Plotcall Binary and ASCII Files: Used to create Plotcall files - for compatibility with VIEWLOG for DOS.

Printer: Select from a list of installed printers.

File Name: Enter the name of the output file. The output file is used for DXF, WMF and Plotcall file output.

Page Setup: Click to enter the printer settings dialog box, from which page size and other aspects of the printer setup are controlled.

Copies: Number of complete copies of the plot generated by the printer.

> **Note:** Some printers cannot automatically generate multiple copies (depending on the printer driver). If the printer cannot generate multiple copies, the **Copies** value will be reset to 1 after entering the **Plot Setup** dialog box.

Size: Relative size of the plot, in percent.

> **Note:** Some printers cannot automatically scale the plot size (depending on the printer driver). If the printer cannot use this size setting, the **Size** value will be reset to 100% after entering the **Plot Setup** dialog box.

Save Page Settings: Check this box to make the **Plot Setup** settings the default Windows settings. If left unchecked, changes to the **Plot Setup** are only saved for the duration of the VIEWLOG session.

Plotcall pens, Default pen: Used for the Plotcall Binary and ASCII output device options.

New Drawing

The **File/*New Drawing*** function creates a new drawing (MAP file) in memory.

Open Drawing File

The **File/*Open Drawing File*** function is used to open an existing drawing file (MAP extension).

Exit

From the Log Editor, the **File/*Exit*** menu item is used to exit VIEWLOG. If changes have been made to the files and they have not been saved, the user will be prompted with an option to save the data.

Edit Menu

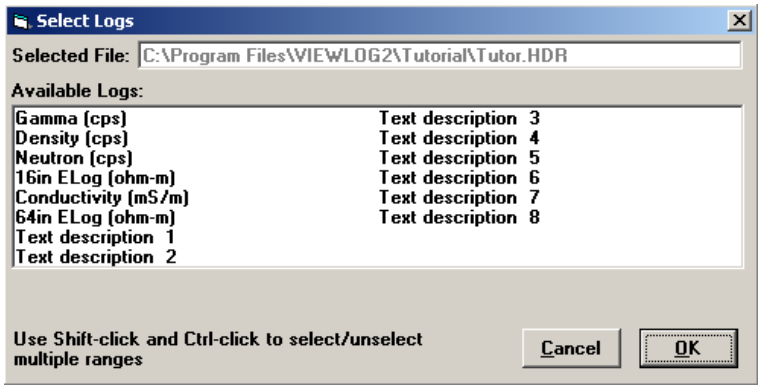
Select Logs

In the Log Editor, the **Edit/*Select Logs*** function (Shortcut: **F2**) is used to select one or more logs for processing or subsequent editing changes. For example, selecting three logs, and choosing the **Edit/*Delete*** function, will delete all three logs from the file.

Log and text description, can also be selected using the **Edit/**Select Log Menu dialog box.

Select Log Menu

In the Log Editor, the **Edit/*Select Log Menu*** function is used to select one or more logs from an available file. The log names and text interpretation data sets are presented:



Select Logs.

The **Select Logs** dialog box is also displayed when logs are being imported, allowing the user to select only a subset of the logs in a file being converted.

Cancel Current Function

The **Edit/*Cancel current function*** (Shortcut: **F3)** cancels the current mouse function.

Depth Shift

The **Edit/*Depth shift…*** function is used in the Log Editor to vertically shift a log to correct for errors in the starting depth (also known as depth correction). This function allows the user to vertically shift the data in an interactive manner with the mouse. The **Depth Shift** function is generally used to shift logs relative to one another. To change the reference elevation of the well, change the **Elevation** parameter in the **Format/**Header dialog box.

> **Note:** Reducing the vertical thickness of data visible on-screen (i.e., zooming in) can increase the accuracy of the depth shifting.

Average Logs

In the Log Editor, the **Edit/*Average Logs*** menu is used to average multiple logs and combine them into a single, new log. It is not necessary for the logs to begin and end at the same depth, or have the same digitization interval. Only overlapping sections of the logs will be averaged. The Average Logs function is a useful tool to link multiple sections of log data. If the logs do not overlap at all, the "no data" value will be substituted in the gap. More than two logs may be averaged at one time.

1. Selection of logs for averaging: The first step is to select the logs with the **Edit/**Select Logs function.
2. Complete the averaging function: Once the logs are selected, select **Edit/*Average Logs*** to begin the averaging. When completed, a new log column will be created, in which the averaged log will be drawn. The word "Averaged" will begin the new log name, and the log scales will be the same as the first log selected. The log name can be changed in the **Format/**Log Display menu.

Smooth Logs

In the Log Editor, the **Edit/*Smooth Logs*** menu is used to smooth the log data. This function can be useful with nuclear logs, which are recorded using a statistical counting process. Two smoothing filters are available: (1) **Boxcar** and, (2) **Taper** weighted moving averages. With the **Boxcar** filter, each of the n points within the filter zone is equally weighted.

The size of the filter zone is related to the digitization interval. For example, if the log selected for smoothing has a digitization interval of 0.1 m, an 11-point **Boxcar** filter is equivalent to a 1-m weighted moving average (the log value at each depth point represents the average value of the measurements within 0.5 m above and below).

When using the **Taper** filter, the log values near the center of the **Taper** filter are weighted greater than those at the edges. A **Taper** filter will smooth the log less than a boxcar filter of the same size.

Stretch Log

When this option is selected, notice how the Status Bar in the upper left corner of VIEWLOG reads: “STRETCH LOGS” Next, select the upper and lower boundaries to be stretched. Next, press and drag the left mouse button to define the stretch. Once this is done, VIEWLOG will display a dashed line that shows the stretched log, and the user will be asked if they want to accept the stretch.

Blank Log Section

The **Edit/*Blank log section*** function is used in the Log Editor to remove data from a log. The function can be used to remove bad data, or data such as calibrations tests, which may have been recorded at the beginning or end of a logging run. The function may also be used with the average function to trim and link sections of various logging runs to produce one log.

If the bad data is at the top or bottom of the log, the log is simply trimmed. If the selected interval is within the log, the log values are replaced with the VIEWLOG No-data value (-999999).

1. Select **Edit/*Blank log section*** from the Log Editor.
2. Click left mouse button and drag the mouse within the log column to define the blanking interval.
3. Select **Yes** or **No** to accept or reject the blanking.

Edit Database Table

In the Log Editor, the **Edit/*Edit Database table*** function is used to edit the database from within VIEWLOG. If the current project is not connected to a database, this function will bring up the **Edit/**Point Edit option.

Point Edit

The **Edit/*Point Edit*** dialog box is used to directly edit the numerical log values. This function is useful for removing spikes or other bad data in the log.

Interactive Point Edit

When this option is selected from the **Edit/*Interactive point edit*** in the Log Editor, the user can use the mouse to drag individual data points to new values. When selected, the status bar will read “INTERACTIVE POINT EDIT: Click and drag to move a log data value” The values will be shown to the right side of the status bar. Click and drag the mouse to move a specific point within a log.

Resample Logs

In the Log Editor, the **Edit/*Resample logs*** functions provide a powerful set of tools for data resampling. It is important to note that VIEWLOG does not require that all logs in one file have the same sample interval. A smoothly varying 64-inch E-Log does not need the sample frequency as a focused, high resolution, logging tool. The **Edit/*Resample logs*** functions can be used to drop data from those logs that do not need high-resolution sampling. Resampling can be performed in three ways:

Average Points

The **Average Points** function is used to average multiple measurements in order to produce a new measurement. For example, averaging three points into one new measurement will reduce the number of log values by two thirds. An odd number of points must be specified.

Drop Points

The **Drop Points** function can be used to simply drop log measurements. For example, entering a drop point increment of 2 will remove every other measurement.

Interpolate Point

The **Interpolate Points** function can be used to either increase or decrease the sample interval. Any value can be specified.

Database Browser

In the Log Editor, the **Edit/*Database Browser*** command can be used to view the database from within VIEWLOG. When selected, VIEWLOG will open a new window, which includes the log data. The database can then be edited within VIEWLOG.

Create New…

In the Log Editor, the **Edit/*Create New…*** menu can be used to generate a new track within a log. This function is mainly used to create log templates.

Even Depth Spacing Log

This option will create an even depth spacing log.

Uneven Depth Spacing Log

This option will create an uneven depth spacing log.

Interval Log

This feature is mainly used for Density data. Data for this option is interval data, rather than point data (i.e., “from” and “to” values are required, as opposed to individual point data).

Dip Structure Log

This option allows the user to input strike and dip information for tadpoles.

Text/Litho/Photo Column

This option can be used to create a new column that in turn can be used to display text, lithology (see Lithology Symbol Editor) or borehole photographs.

Cut

In both the Log Editor, the **Edit/*Cut*** command (Shortcut: **Ctrl+X)** is used to copy and delete selected objects (i.e., drawing objects, logs, etc.) to the VIEWLOG Clipboard. Note that these

objects will not appear on the Windows clipboard because they are incompatible with other programs. Objects on the VIEWLOG clipboard can only be pasted onto other VIEWLOG forms. For example, you can use the **Cut** command to move a log from one file to another.

Copy

In both the Log Editor, the **Edit/*Copy*** command (Shortcut: **Ctrl+C**) is used to copy selected objects (i.e., drawing objects, logs, etc.) to the VIEWLOG Clipboard. Note that these objects will not appear on the Windows clipboard because the format is incompatible with other programs. Objects on the VIEWLOG clipboard can be pasted onto other VIEWLOG forms. For example, you can use the **Copy** command to copy a log from one file to another.

Paste

The **Edit/*Paste*** function (Shortcut: **Ctrl+V**) is used to insert objects from the clipboard.

Delete

The ***Edit/Delete*** function (Shortcut: **Delete**) deletes all objects that are currently selected.

View Menu

Preview Mode

In the Log Editor, the **View/*Preview Mode*** option displays an exact representation of the plot format. Formatting commands, which allow the plot configuration to be changed interactively, are available in preview mode. In addition, **Zoom All** and **Pan** functions in can be used to enlarge the preview image.

> **Note:** Double click on an object in **Preview Mode** to load the appropriate formatting dialog box.

Preview Format Only

The Log Analysis **View/*Preview format only*** option is used to suppress the drawing of the log data during **Preview Mode**. This can speed screen redraw times when formatting logs in **Preview Mode**.

3D View

Under Construction.

Zoom In

In the Log Editor, the **View/*Zoom*** In function (Shortcut: **F4**) is used to enlarge the display of information on screen.

PROCEDURE:

1. Click and hold the left button at the upper left corner of the desired zoom window.
2. Draw with the mouse to define the extents of the window. While dragging, a box will appear on the screen showing the region that will become the new screen window.
3. Once the mouse button is released, the screen will redraw using the parameters defined by the box.

> **Note:** When zooming in while in log editing mode the lateral extent of the window is not important, as the box only defines the new top and bottom of the screen.

Zoom Out

In the Log Editor, the **View/*Zoom Out*** menu item (Shortcut: **F5**) increases the amount of information displayed on screen.

Zoom All

In the Log Editor, the **View/*Zoom All*** option (Shortcut: **F6**) sets the screen display so that all the available data, either logs or drawing objects, are displayed.

Zoom Last

In the Log Editor, the **View/*Zoom Last*** menu item (Shortcut: **F7**) sets the screen scaling parameters to those last used.

Next Page

In the Log Editor, the **View/*Next Page*** function can be used to scroll down to the next page within the log view. The **Page Down** key performs the same task.

Previous Page

In the Log Editor, the **View/*Previous Page*** function can be used to scroll up to the next screen page within the log view. The **Page Up** key performs the same task.

Move to Top

In the Log Editor, the **View/*Move to Top*** function allows the user to jump to the top of the logs.

Move to Bottom

In the Log Editor, the **View/*Move to Bottom*** function allows the user to jump to the bottom of the logs.

Depth Scale…

In the Log Editor, the **View/*Depth Scale…*** function allows the user to select a different on-screen depth scale (i.e., depth viewing range). When this function is selected, a list of depth scales will appear. The user can select one of those from the list, or enter their own scale value.

Thickness

In the Log Editor, the **View/*Thickness*** menu item is used to change the thickness of log data that is displayed. When selected, the user is prompted to enter a new desired thickness.

Screen Top

Change the depth from which the log can be viewed.

Pan

The **View/*Pan*** menu function (shortcut: **F8**) is used to shift the log or drawing image to view a different portion of the image. Pressing and holding the left button and dragging the mouse either up or down the screen will shift the screen window. A line will appear while the mouse button is held down to indicate the pan movement and distance.

Update

The **View/*Update*** command redraws the screen, refreshing the image display. The **Update** command can also be executed by using the **F9** key.

Copy Metafile to Clipboard

The **View/*Copy metafile to clipboard*** function can be used in the Log Editor to copy an image of the log data or cross plot to the Windows clipboard. This image can be pasted into popular word processors or other software packages.

> **Note:** Images can only be copied to the clipboard if the user draws a box in **Page View** first.

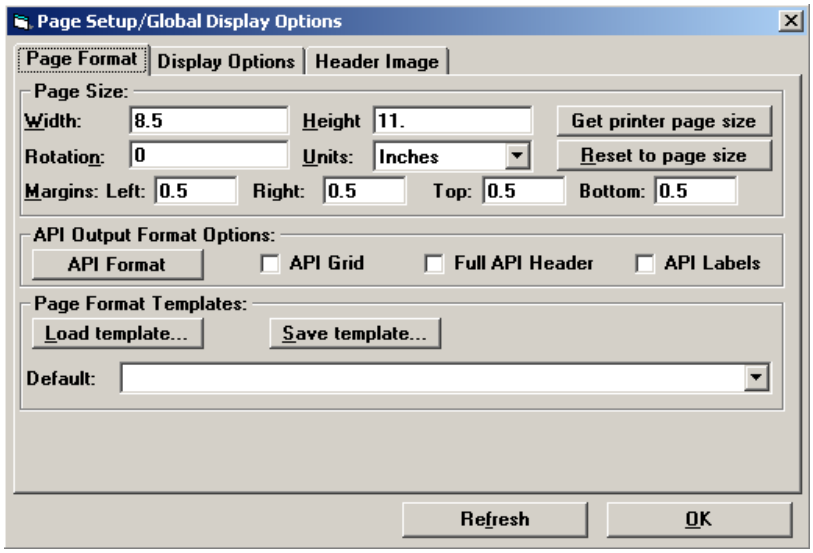
Format Menu

Page/Global Settings

The **Format/*Page/Global Settings*** dialog box in the Log Editor provides control over general screen and plotting parameters. The window that appears contains three tabs: (1) **Page Format**, (2) **Display Options** and (3) **Header Image**.

Page/Global Settings: Page Format Tab

This tab is used to set the size of the print page.



Page/Global Settings - Page Format Tab.

Page Size:

Plot Width: This parameter controls the width of the plot. The **Plot Width** is the total width, in inches, of all the columns, including the left and right margins.

Plot Height: This parameter controls the overall height of the plot. The plot length includes the top and bottom margins, header text and log column length.

Get printer page size: This button will set the width and height to match with the current page size of the printer.

Reset to page size: If the **Plot Width** is set to 8.5 inches, for example, and the reset function is selected, the program will calculate track spacings and text sizes for a width of 8.5 inches.

Margins: The width of the page margins.

API Output Format Options:

API Format: Select this option to reset all the parameters to API format output.

API Grid: This format divides the track into 10 equal divisions.

Full API Header: The API output may use either a short or long (Full) header. The short header is similar to that of the Log Column output, while the long header includes the entire borehole record and log comment sections.

API Labels: When this format of log name labels are selected, the log name is centered above the track, and the units, if in parenthesis, are printed below.

Page Format Templates:

Load/Save Template Buttons: Loads or saves a page format template

Page/Global Settings: Display Options Tab

Quick Redraw: This speeds screen redrawing by automatically skipping log values when there are many more log values than screen lines. For example, when drawing a log with 2000 data points on a 800x600 pixel Super-VGA screen, approximately every other point will be skipped when **Quick Redraw** is enabled. Because the screen resolution is not capable of showing all 2000 points, the image will appear nearly identical to a one with all the points drawn. When the zoom function is used, all the data values will be drawn. Disable this parameter to always draw every log data value.

Sketch Lines: No longer used.

Solid Fills: Controls the display of shading between the logs. Fills are defined in the **Format/**Log Fill menu.

Polar Plots: This parameter controls whether polar plots are displayed on screen and paper. For further information on Polar Plots, consult the Breakout Menu.

Black and white output: This forces all output colors to black.

Plot Preview Mode: Displays a representation of the plot.

Show Stats: This controls whether saved log stats are displayed on screen and in output.

Track Border:

Border Line Thickness: This controls the thickness of border lines.

Suppress all border lines: If checked, border lines will be suppressed.

Track Background Color:

Filled Background: Filled backgrounds can be added to tracks.

Color: Select the color for the background fill.

Page/Global Settings: Header Image Tab

File: The name of a graphics that can be placed on the plot. This option can be used to place a company logo or other graphic on the plot. The graphics file can be created using the VIEWLOG Map Editor. File types include MAP, WMF, EMF, BMP, RLE, JPG, GIF, TIF, PNG.

Select: Click to select the graphics file.

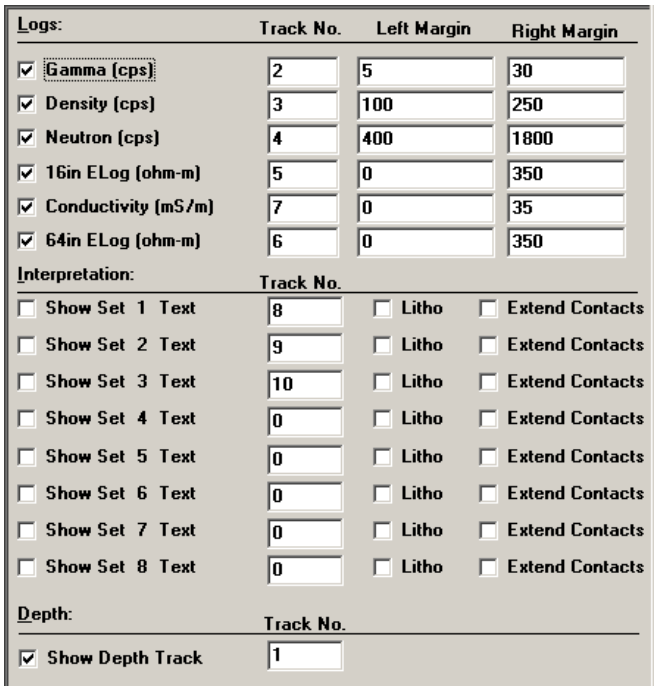
Edit: If the selected graphics file is a VIEWLOG MAP file, this button can be clicked to edit the MAP file within the VIEWLOG Map Editor.

X Offset: The horizontal distance, in page units (inches or cm) that the lower left corner of the image is shifted, relative to the lower left corner of the page.

Y Offset: The vertical distance, in page units (inches or cm) that the lower left corner of the image is shifted, relative to the lower left corner of the page.

Display List

The **Format/*Display List*** (Shortcut: **F11**) presents an overview of all logs, their track numbers and scaling parameters. Full control over all the display parameters is provided in the **Format/**Log Display, **Format/**Interpretation text and **Format/**Depth menu items. This figure shows the **Display List** window.


Logs:
Track No.
Left Margin
Right Margin
Gamma (cps) 2 5 30
Density (cps) 3 100 250
Neutron (cps) 4 400 1800
16in ELog (ohm-m) 5 0 350
Conductivity (mS/m) 7 0 35
64in ELog (ohm-m) 6 0 350
Interpretation:
Track No.
Show Set 1 Text 8 Litho Extend Contacts
Show Set 2 Text 9 Litho Extend Contacts
Show Set 3 Text 10 Litho Extend Contacts
Show Set 4 Text 0 Litho Extend Contacts
Show Set 5 Text 0 Litho Extend Contacts
Show Set 6 Text 0 Litho Extend Contacts
Show Set 7 Text 0 Litho Extend Contacts
Show Set 8 Text 0 Litho Extend Contacts
Depth:
Track No.
Show Depth Track 1

Display List.

Menu Items:

1. **Logs**: Place a check beside the log name to display the log on screen.
2. **Track**: The order in which the logs are plotted on the screen, from left to right, may be changed by editing the track number. The depth track and facies information also occupy tracks, which cannot be shared with log data. Up to four logs may be placed in one track.
3. **Left** and **Right Margins**: The log-scale margins are set by selecting one of the margin parameters and editing the value. The margins may be set to any value; however, if the scale is logarithmic, the value must be greater than zero. VIEWLOG will not allow the left margin to equal the right margin. The left and right margin values are used for the screen, cross plot and output presentation. When editing a value, the up and down arrow keys can be used to move the editing cell to other log values.

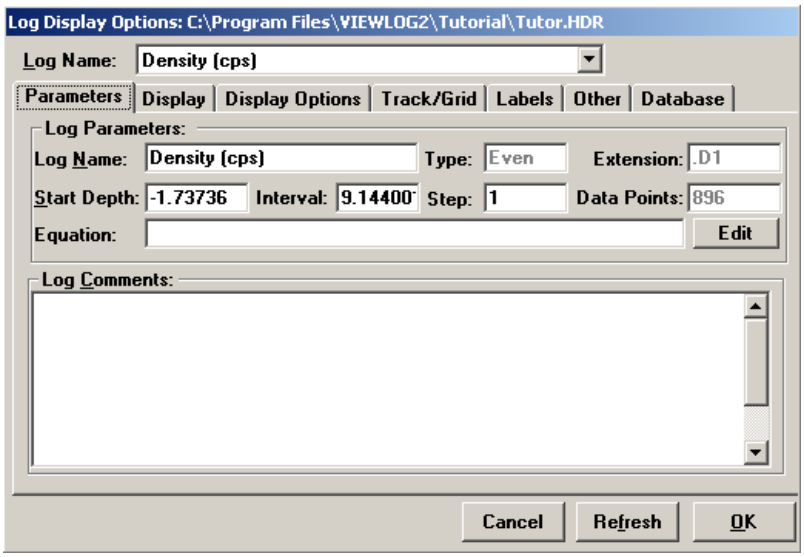
> **Note:** Reverse scaling can be created by setting the left margin greater than the right.

4. **Litho**: This box should be checked if the user wants to display the lithology column.
5. **Extend Contacts**: This box should be checked if the user wants to extend contact lines across all log tracks.
6. **Depth Track**: To display the depth track, check this box. The placement of the depth track can be changed by specifying a new track number.

Log Display

The **Log Display** window is used to edit a number of parameters related to each log trace. The menu can be accessed either from the **Format/*Log Display*** menu item, or by double clicking on the log trace. The menu is divided into four tabbed sections, as discussed below.

Log Display: Parameters Tab



Log Display Options - Parameters Tab.

Log Parameter

Log Name: The log name can be up to 24 characters long. If a part of the name is enclosed in brackets, that portion will be treated as units, and will be plotted beneath the first part of the name when API format output is selected. For example, If the log name is entered as "Gamma Ray (cps)", the (cps) will be printed below the "Gamma Ray" text on API format log plots.

Log Type: Specifies the type of log, including evenly spaced (depth interval) data, unevenly spaced. dipmeter, etc.

Extension: The file extension of the log.

Start Depth: The depth or elevation of the first measurement.

Interval (Digitization Interval): The digitization interval can be edited to stretch or compress the log. The interval parameter is not used when the data is unevenly spaced.

Step: To plot every other measurement, enter a step of 2.

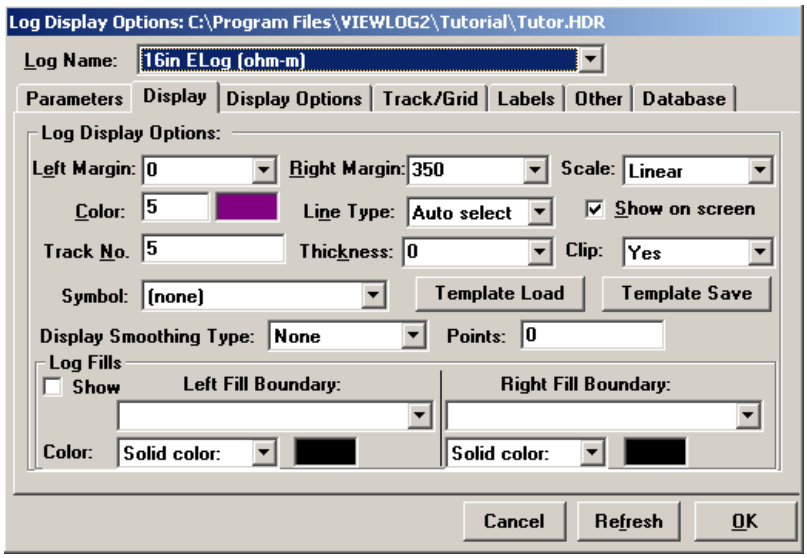
Data Points: The number of log measurements.

Log Comments

Text comments associated with a log. When a new log is created with the log calculation function, the log equation is stored, for reference, in this section. Other editing functions, such as depth shifting and smoothing are also logged in the comments field.

Log Display: Display Tab

The **Display** tab controls the display of the log data within the tracks.



Log Display Options - Display Tab.

Log Display Options

Left and **Right Margin**: The log values for the left and right margins of the track.

Scale: Two scale types are presently supported by VIEWLOG, linear and base-10 logarithmic. If either of the margin values are zero or negative when the scale type is switched to logarithmic scaling, the program will convert that margin to a value of .001. Use caution when converting the scale to logarithmic, as negative or zero log values will be lost. Switching between scale types often requires modification of the margin values in order for the data to be presented within the log data column. If a log "disappears" from the screen after a switch, it may mean the margins are significantly out of the range of the data.

Color: The color of the log trace on the screen.

Line Type: A list of the line styles.

Show on screen: Check to display the log on screen and in output.

Track No.: The column in with the log is plotted. Up to 4 logs may share the same track.

Thickness: The width of the log trace line, in inches or cm (page units are defined in the **Format/*Page Setup*** dialog box).

Clip: Controls whether log values are displayed when they exceed the left and right margin.

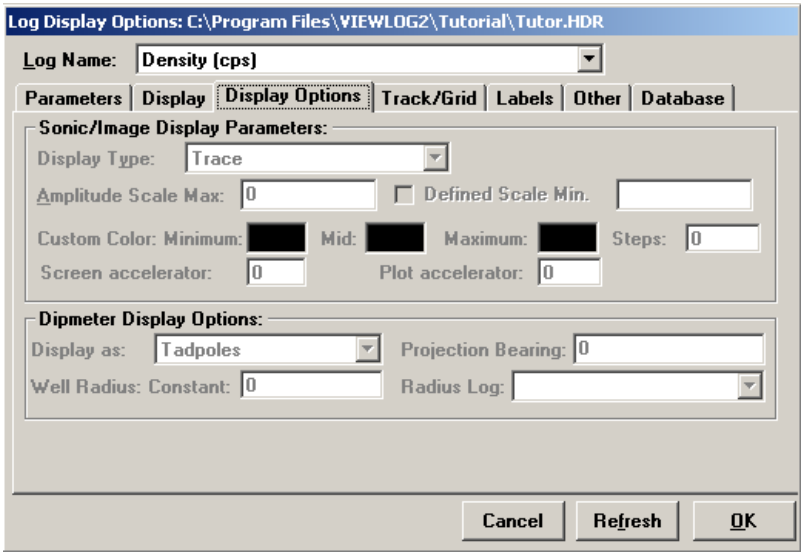
Symbol: Controls the display of a symbol at each log data point.

Template Load: This button is used to select a log format template.

Template Save: This button is used to save the current display settings as a log template.

Within a log track, Log data can also be filled, see Log Fill.

Log Display: Display Options Tab



Log Display Options - Display Options Tab.

Sonic/Image Display Parameters:

If the log is a full waveform sonic data type, the following options will be available:

Display type: Controls how the log information is displayed. The options include:

Wiggle trace: Display the sonic data as traces.

Black and White VDL (Variable Density Log): Display the trace amplitude as a grey scale ranging from black to white.

Color Spectrum VDL: Display the trace amplitude as a color spectrum ranging from blue, through yellow to red and purple.

Custom Color VDL: Display the trace amplitude as a color spectrum ranging from the **Min**, through the **Mid** and up to the **Max** color values, specified below.

Amplitude Scale: Scales the amplitude of the trace and VDL style data. To make the amplitude of the wiggle traces smaller on screen, enter a larger scale value.

> **Note:** To reverse the amplitude, enter a negative amplitude scale.

Custom Color: Min., Mid and **Max**.: Colors used when the **Display Type** is set to **Custom Color VDL**.

Steps: Number of color steps used to generate the VDL color range. Using fewer colors improved redrawing speed and reduces the size of the output files. Typically, 32 or 64 steps are suitable. Values as low as 2 and as high as 256 are also possible.

Screen accelerator: This parameter can be used to speed screen redraws by skipping data values when redrawing. To display all data, use a value of 1. Typical values are between 2 and 8.

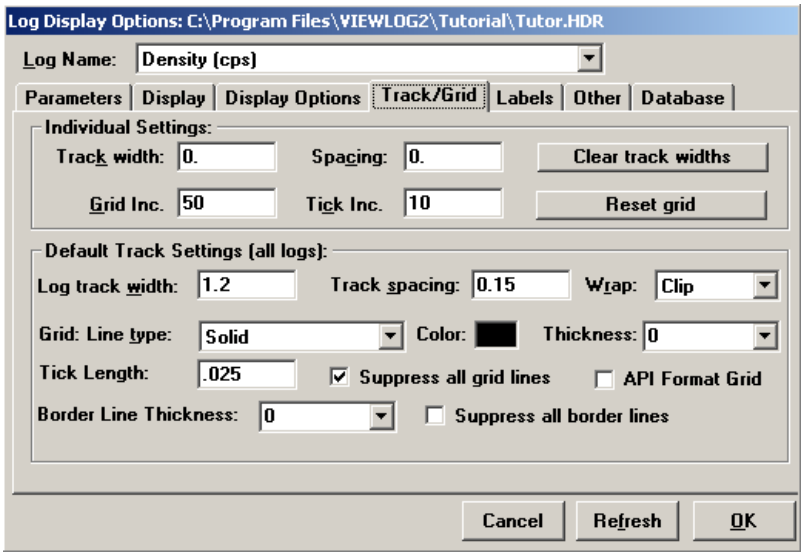
Plot accelerator: This parameter can be used to speed plotting by skipping data values when redrawing. To plot all data use a value of 1. Typical values are between 2 and 8.

Dipmeter Display Options:

This option allows the user to display strike and dip (i.e., tadpole), well bearing and well radius of a borehole.

Log Display: Track/Grid Tab

The **Track/Grid** tab controls the individual grid and track display parameters for each log. Normally these do not need to be set because the program calculates default values. The menu can be accessed either from the **Format/**Log Display menu item, or by double clicking on the log trace.



Log Display Options - Track/Grid Tab.

Individual Log Settings:

Track width: The width of the log track in page units.

Spacing: The right margin spacing (in page units), which forms an optional blank border along the right edge of the log track.

Grid Inc.: The grid increment is the spacing, in log units, between individual grid lines. No grid lines will be plotted if the grid increment is set to a value less than or equal to zero.

Tick Inc.: The tick increment is the spacing, in log units, between scaling ticks. Reasonable defaults are used, and no ticks will be plotted if the tick increment is set a value less than or equal to zero.

Default Log Track Settings:

The following value apply to all logs, by default:

Log track width: The width of the log track in page units.

Track spacing: The right margin spacing (in page units), which forms an optional blank border along the right edge of the log track.

Wrap: Controls whether logs, by default, wrap when they reach the margin values.

Grid: Line type: Controls the line style (solid, dotted, dashed, etc.)

Color: Grid line color.

Thickness: Grid line thickness, in page units.

Tick Length: Defines the length of the tick marks, as a percent of the column length.

Suppress all grid lines: Turns off all log column grid lines.

API Format Grid: Subdivides the log data range into 10 equal divisions for grid lines.

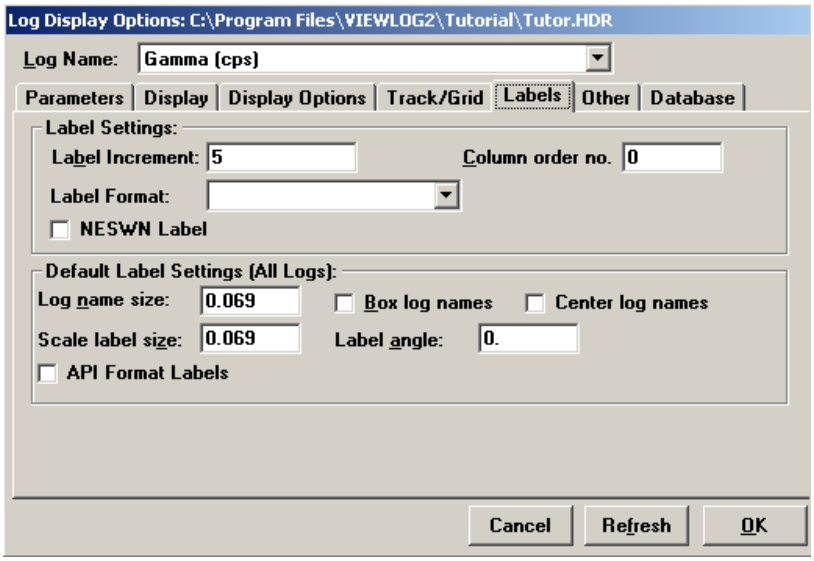
Border Line Thickness: Thickness of border lines.

Suppress all border lines: Check this box to suppress border lines.

> **Note:** Some combinations of line style, thickness and color may not be correctly rendered on all printers. This is a limitation of the 16-bit Windows GDI.

Log Display: Labels Tab

In the Log Editor, at the top of each track below the name of the track, a horizontal scale shows the values of the track parameter. The **Labels** tab in the **Format/*Log Display*** is used to control the display of this horizontal scale.



Log Display Options - Labels Tab.

Label Settings

> **Note:** From the top of this window, select the **Log Name** for which the changes will apply.

Label Increment: Controls the increment for the labels.

Column order no.:

Label Format: This controls the display format of the track labels.

Default Label Settings (All Logs):

Log name size: Controls the text size for the names of the logs.

Box log names: If checked, a box will be placed around the log names. If unchecked, no box will appear.

Center log names: If checked, log names will be centered in the track. If unchecked, log names will be left justified.

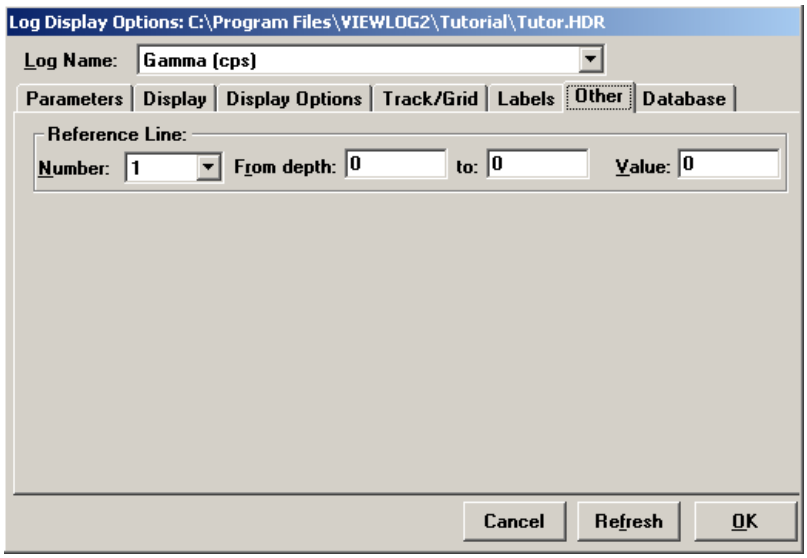
Scale label size: Controls the text size for the scale labels.

Label angle:

API Format Labels:

Log Display: Other Tab

The **Log Display: Other** tab contains the log reference line settings. The menu can be accessed either from the **Format/*Log Display*** menu item, or by double clicking on the log trace.



Log Display Options - Other Tab.

Reference Lines:

Up to three vertical marker lines can be plotted with a log. These can for example, be used to display the bit size for comparison to a caliper log. Reference lines consist of:

Number: The reference line number (range 1 - 3).

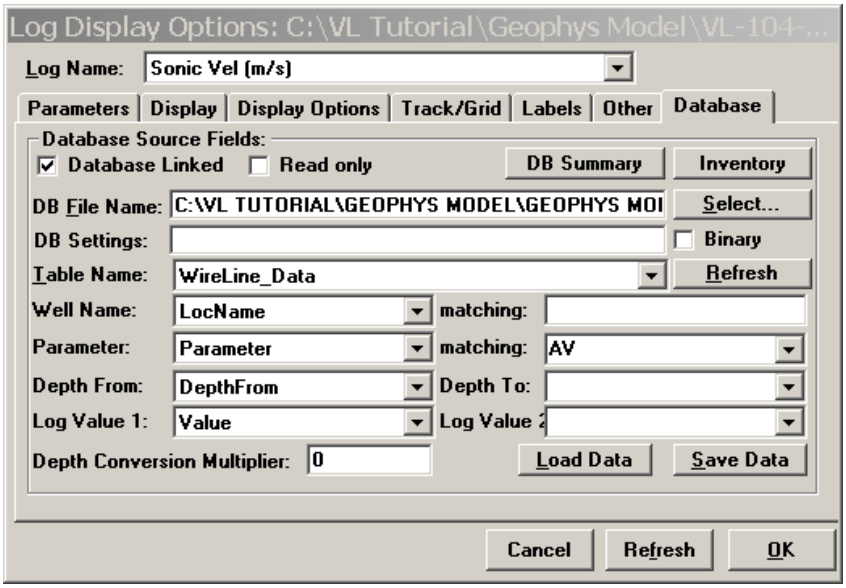
From depth: The starting depth of the reference line. Note that depth below ground surface is negative.

To depth: The depth at which the line stops.

Value: The log value at which the reference line is drawn.

Log Display: Database Tab

The **Database** tab is used to connect to the database.



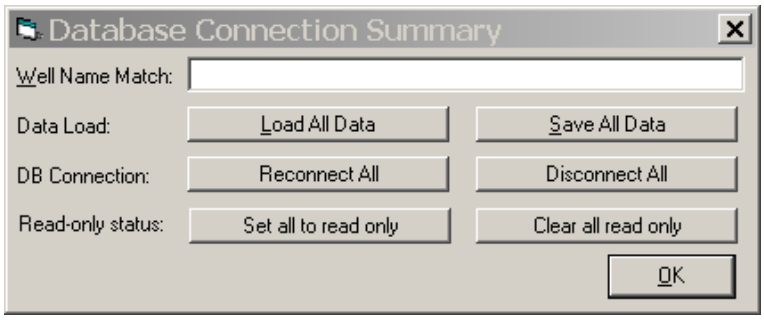
Log Display Options - Database Tab.

Database Source Fields:

Database Linked: When checked will link the trace to the database.

Read only: When checked on will only display in read-only mode.

DB Summary:



Database Connection Summary.

Well Name Match: Type in the Well Name

Data Load:

Load All Data: Load all the data for the defined well (above) in the tracks displayed in the log editor.

Save All Data: Save all the data for the defined well (above) in the tracks displayed in the log editor to the database.

> **Note:** Using this save feature will *overwrite* the existing data in the database.

DB Connection:

Reconnect All: Reconnects all the displayed traces to the database (i.e. check on the Database linked field in the database source fields).

Disconnect All: Disconnects all the displayed traces to the database (i.e. check off the Database linked field in the database source fields).

Read-only status:

Set all to read only: Will set all the displayed traces to read only (i.e. will check on the **Read only** field in the Database Source Fields).

Clear all to read only: Will unset all the displayed traces to read only (i.e. will check off the **Read only** field in the Database Source Fields).

Inventory: By selecting this button, the **Log Database Inventory** window will appear. This window will allow the user to view the available logs and interpretation data.

DB File Name: The file name of the database. Use the **Select…** button to browse for the database file.

DB Settings: Comment field.

Binary: Will convert the database connection fields to binary format.

Table Name: The name of the specific table within the database.

Well Name: Database field that contains the well name.

Parameter: Database field that contains the parameter.

Matching: This can be used to search either the **Well Name** or **Parameter** field for a specific character string.

Depth From/Depth to: Controls the depth of, for example, the well screen. This can be used to point to specific fields within the database.

Log Value 1: Value to be plotted in the current log track. This option points to a specific field within the database.

Log Value 2: A second value to be plotted in the current log track. This option points to a specific field within the database.

Depth Conversion Multiplier:

> **Note:** The options available under the **Database** tab are only available in the Database edition of VIEWLOG.

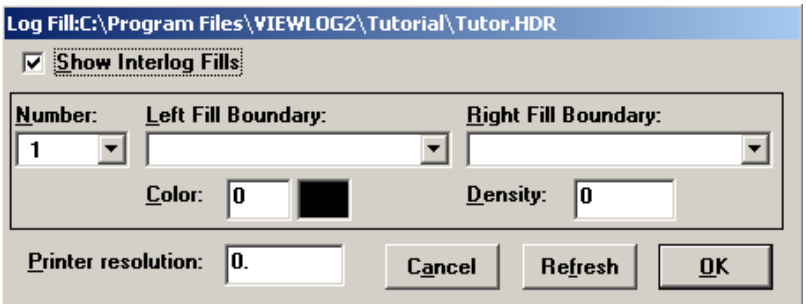
Load Data: Loads data for the specified well.

Save Data: Saves data as displayed in the trace to the database.

> **Note:** Saving the data from this menu will **overwrite** the existing data in the database.

Log Fill

In the Log Editor, the **Format/*Log Fill*** menu is used to fill, or shade, the space between two logs, or a log and a constant value. The **Log Fill** menu is accessed from the Log Analysis Format Menu Fills can be displayed by checking **Show interlog fills** parameter in the **Log Fill** menu.



Log Fill.

Up to 15 log fills may be defined. The left and right controlling boundary parameters must be defined, and the **Color** and fill **Density** can also be defined. The available logs are listed in the drop-down boxes.

To fill the space between a log scale constant value on the left, and a log curve on the right, enter the scale constant in the **Left Fill Boundary** column, and the log name in the **Right Fill Boundary** column. To fill between two logs in the same track, enter log references in the left and right margin columns. The fill value can only fill the space between logs in the same track.

The order of the log fills can be important, as multiple fill types can refer to the same log. For example, one definition could fill the left part of the column with one color, a second could fill the right with another color, and the difference between the logs filled with a third color. The fills are applied in the order specified in the Number box.

Density: The frequency of fill lines, relative to the printer resolution.

Printer resolution: The resolution, in lines per inch, of the output device. The value required to achieve a solid fill depends on the resolution of the printer. For example, most laser printers require between 100 and 300 lines per inch for a solid fill, but you should experiment with your printer. Different resolution values can be used to change the appearance of the log fill. Enter a value of 0 to use the default fill **Density** parameter.

Keep the printer resolution number as small as possible to reduce drawing times and output file sizes.

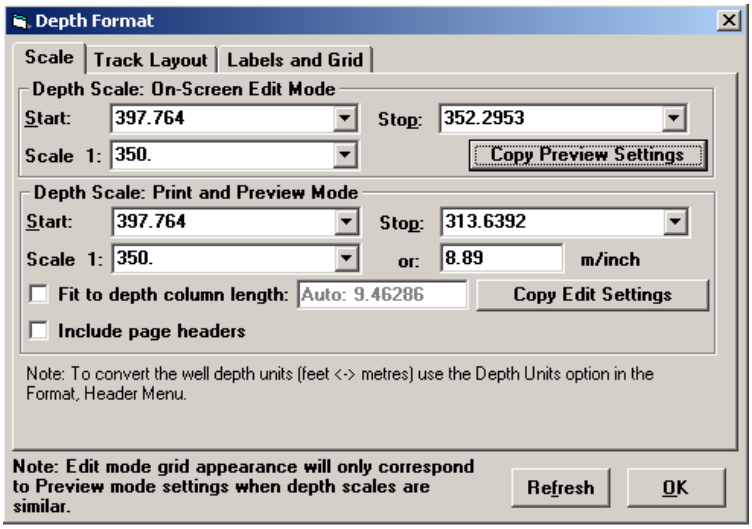
> **Note:** Log Fills can also be defined in the Log Display: Display Tab.

Depth

The **Format/*Depth*** function contains options for formatting the depth column in the Log Editor. Depth functions can be changed independently for both On-Screen Edit Mode and Preview Mode.

The following tabs are included:

Depth Format: Scale Tab:



Depth Format - Scale Tab.

Depth Scale: On-Screen Edit Mode

Start: The depth (or elevation) at which the plot starts. Note that depth below ground surface is negative.

Stop: The depth at which plotting of the log data will stop.

Scale 1: Controls the scale on the screen. Enter either the ratio value (1:value), or units in m/inch.

Copy Preview Settings:

Depth Scale: Print and Preview Mode

Start: The depth (or elevation) at which the plot starts. Note that depth below ground surface is negative.

Stop: The depth at which plotting of the log data will stop.

Scale 1: Controls the scale on the screen. Enter either the ratio value (1:value), or units in m/inch.

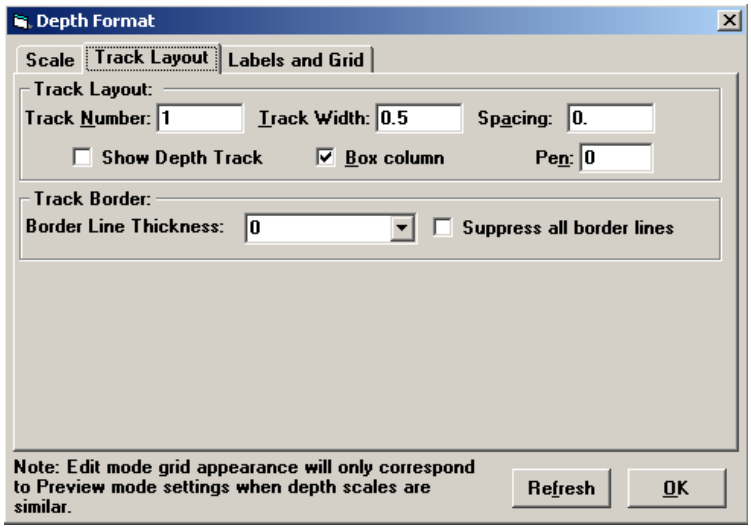
Or:

Fit to depth column length: Check this box to have VIEWLOG fit the depth interval within a specified column length. When unchecked, VIEWLOG displays the calculated length of the log column in the Length text box.

Include Page Headers:

Copy Edit Settings:

Depth Format: Track Layout Tab:



Depth Format - Track Layout Tab.

Track Layout

Track Number: The column number in which the depth information will be placed.

Track Width: The width of the depth track.

Spacing: The separation between the right edge of the depth track and the next track.

Show Depth Track: Controls whether the depth track is displayed. In some cases, (such as on cross section) it is desirable to suppress the depth column.

Box Column: This option draws a border around the depth track.

Pen: This option controls the pen color. An integer can be entered.

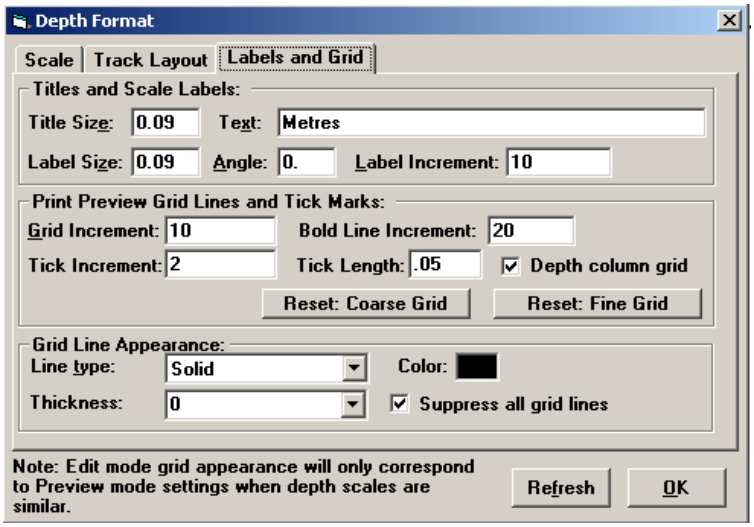
Track Border

Border Line Thickness: Controls the line thickness of border lines.

Suppress all border Lines: Suppresses the borderlines, if checked.

Depth Format: Labels and Grid Tab:

This tab is used to add labels and/or grid to the log.



Depth Format - Labels and Grid Tab.

Titles and Scale Labels:

Title Size: The depth title height, in inches (default).

Text: The depth title, for example, Depth (metres).

Label Size: The text height of the numerical depth labels (in inches).

Angle: The angle of the numerical depth labels.

Label Increment: The spacing, in depth units, between labels.

Print Preview Grid Lines and Tick Marks:

Grid Increment: The grid increment is the spacing, in depth units, between individual grid lines. No grid lines will be plotted if the grid increment is set to a value less than or equal to zero.

Bold Line Increment: The spacing between dark grid lines is set using this function. Note that lines will only appear bold if a grid line is already plotted at that depth.

Tick Increment: The tick increment is the spacing, in depth units, between scaling ticks. Reasonable defaults are used, and no ticks will be plotted if the tick increment is set a value less than or equal to zero.

Tick Length: The length of the depth column ticks, as a percentage of the column width.

Depth column grid: By default, depth column ticks and grid lines only appear in the log columns. This parameter controls whether grid lines and tick marks are drawn in the depth column, as well as in each of the log columns.

Reset: Click to have VIEWLOG automatically select reasonable grid and tick increments.

Grid Line Appearance:

Line type: The line type is specified here.

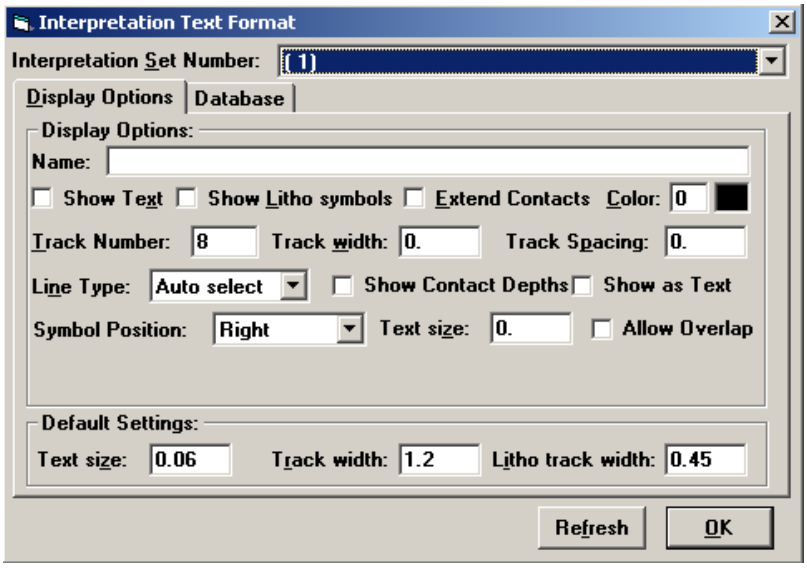
Color: The color of the grid lines.

Thickness: The thickness of the grid lines

Suppress all grid lines: Checking this box will suppress all grid lines.

Interpretation Text

In the Log Editor, the **Format/*Interpretation text*** dialog box controls the display of the text columns on the log plots.



Interpretation Text Format – Display Options Tab.

Interpretation Text Format: Display Options Tab

Display Options

Name: The name of the interpretation set, which appears at the top of the output track.

Show Text: Controls the display of the text column.

Show Litho symbols: Controls the display of the lithology symbol column.

Extend Contacts: When checked, contact lines extend across the screen, otherwise they are restricted to the text or lithology column.

Color: The color of the text and contact lines.

Track Number: The track number controls the order of the facies and log columns.

Track width: The width of the track.

Track Spacing: The separation between the right edge of the text column and the next track.

Line Type: The style of line used for the contact lines (solid, dotted, dashed, etc.).

Show Contact Depths:

Show as Text:

Symbol Position: Controls the location of the symbols within the track.

Text Size: Size of text for the interpretation text.

Allow Overlap: If unchecked, lithologies are filled across all tracks. If checked, lithologies are unfilled across all tracks.

Default Settings:

> **Note:** The **Show Text** button in the above section must be checked.

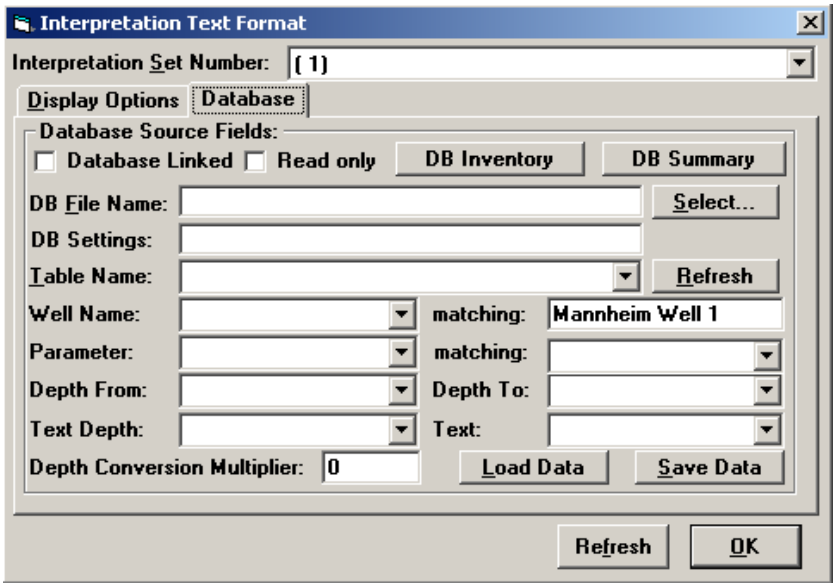
Text size: The height of the facies text (in inches).

Track width: The default width for all text columns (in inches).

Litho track width: The width of the lithology column (in inches).

Interpretation Text Format: Database Tab:

Interpretation text can be linked to a database if the user wishes to link the text to, for example, a well-screen interval.



Interpretation Text Window – Database Tab.

Database Source Fields

DB File Name: The file name of the database. Use the **Select…** button to browse for the database file.

DB Settings:

Table Name: The name of the specific table within the database.

Well Name: Database field that contains the well name.

Parameter: Database field that contains the parameter.

Matching: This can be used to search either the **Well Name** or **Parameter** field for a specific character string.

Depth From/Depth to: Controls the depth of, for example, the well screen. This can be used to point to specific fields within the database.

Text Depth: Database field that contains the text depth.

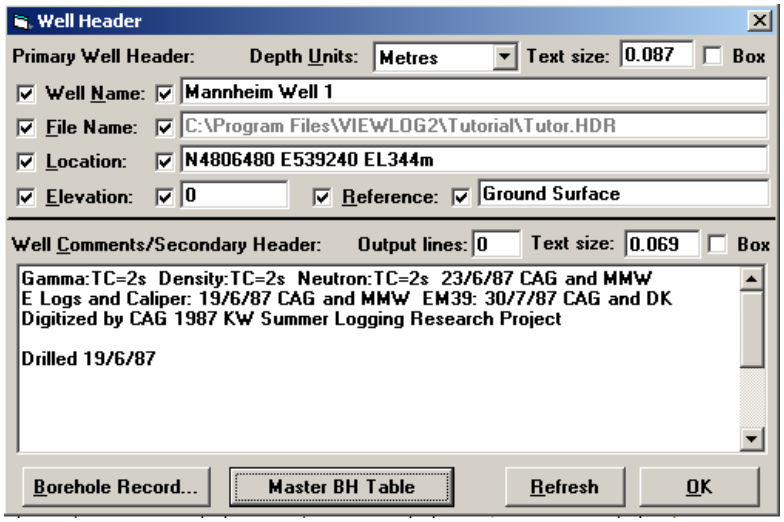
Text: Database field that contains the text.

Depth Conversion Multiplier:

> **Note:** The options available under the **Database** tab are only available in the Database edition of VIEWLOG.

Header

The **Format/*Header*** menu in the Log Editor is used to set and edit well information that is stored in the header file. The header is divided into two parts, the primary and secondary header (In addition, the Borehole Record can be used as a detailed header on long format logs). Portions of the primary header can be hidden by unchecking the boxes beside the field names and field boxes. Portions of the secondary header can be hidden by changing the number of output lines displayed.

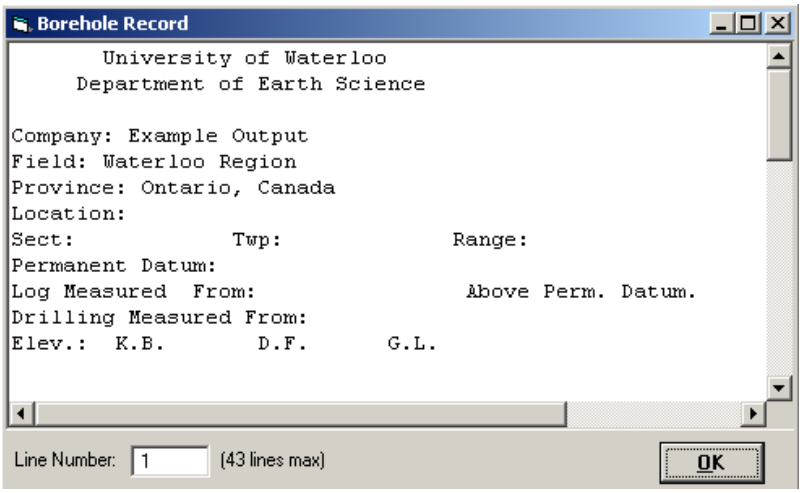


Well Header.

Primary Header Fields: Beside each field name and field text box in the primary header is a check box. To display the user-entered information, check the box immediately to the left of the text box. In addition, to display the field name itself, check the box to the left of the field name.

Well Comments/Secondary Header Fields: The **Output lines** parameter controls how many lines of the well comments are displayed. To hide the entire secondary header, enter 0 output lines.

Borehole Record: The individual borehole record can be displayed by clicking on the **Borehole Record…** button at the bottom of the **Well Header** window. A new window, which shows the borehole record, will appear:



Borehole Record.

Other Menu items:

Depth Units: (Feet - Metres Conversion) VIEWLOG allows depth units to be either feet or metres, and switching between units is performed by selecting this item. To switch between unit systems, simply select this option. All depth related values, such as digitization intervals and contact depths, are changed automatically.

Text size: The size of the title text, in inches.

Well Name: The well name is a text comment, up to 60 characters in length. The name is retained in the log header file and printed when the logs are output.

File Name:

Location: The location is a text string with a maximum length of 60 characters.

Elevation: The elevation is a numerical value used as a reference for the surface elevation of the well. The value may be positive or negative, and generally, all log data will lie below the surface elevation. To work in units of depth below ground surface, set the surface elevation to zero. Logs need not begin or end at the surface elevation. If an elevation other than zero is entered, the depth scale on the logs will be in terms of elevation. All depth references in the file, such as contact locations, will change automatically when the elevation is changed.

Reference: This is used to describe the surface elevation reference. For example, the elevation value may be referenced to ground surface, sea level, casing top, Kelly Bushing, etc.

Box: This is used to draw a solid line around the header. Individual box settings are available for both the primary and secondary header.

Output lines: Number of title lines on output. To suppress the display of the header (i.e., Well name, location, etc.) enter 0.

Comment Text size: The size of the comment text, in inches.

Well Comments/Secondary Header: Fifteen comment lines, up to 80 characters long, can be added to the header (.HDR) file. All non-blank comment lines are printed when a full API header is created. Up to 15 of these comment lines can be printed at the top of any plot, as controlled by the **Output lines** parameter. Sections of the comments can be aligned in columns by inserting

the | character (vertical line) within the comments. The number of columns equals the number of | characters plus one. For example, entering the following:

> **Drilling Date:** 10/10/96 |Drilling Method: Hollow stem auger will left align the "Drilling date" and place the "Drilling Method" text at the center of the header (i.e., in column 2).

3-D Data Display

Under Construction.

Interpret Menu

Contacts

In the Log Editor, the **Interpret/*Contacts*** function (Shortcut: **Ctrl+O**) is used to define boundaries in the log data that correspond to lithologic or formation contacts. Contact depths are stored in the header file (HDR) when the file is saved. Statistical analysis can be performed on data within the contact intervals, and the contacts can be used to control which symbols are used on a cross plot.

The display of contacts is controlled through the **Format/**Interpretation text menu. Contacts are always drawn within the facies and lithology columns; however, if the **Extend contacts** option is set in the **Format/**Interpretation text dialog box, the contact lines will be drawn across the entire screen.

Add Contact: Pressing and holding the left button displays cross-hair reference lines. When the button is released, a contact line is placed if the mouse is within one of the interpretation text or lithology columns. The accuracy of contact placement increases as the vertical thickness of data on-screen is reduced.

Remove Contact: Contacts are removed by pointing at the contact (within the text or lithology column) and pressing the right button.

Text Description

In the Log Editor, the **Interpret/*Text description*** function (Shortcut: **Ctrl+T**) is used to add or remove text from the interpretation columns. Text is added or removed in a manner similar to that described in **Interpret/**Contacts.

Log Calculations

In the Log Editor, the **Interpret/*Log calculations*** function allows nearly any user-defined log equation to be applied to the log data.

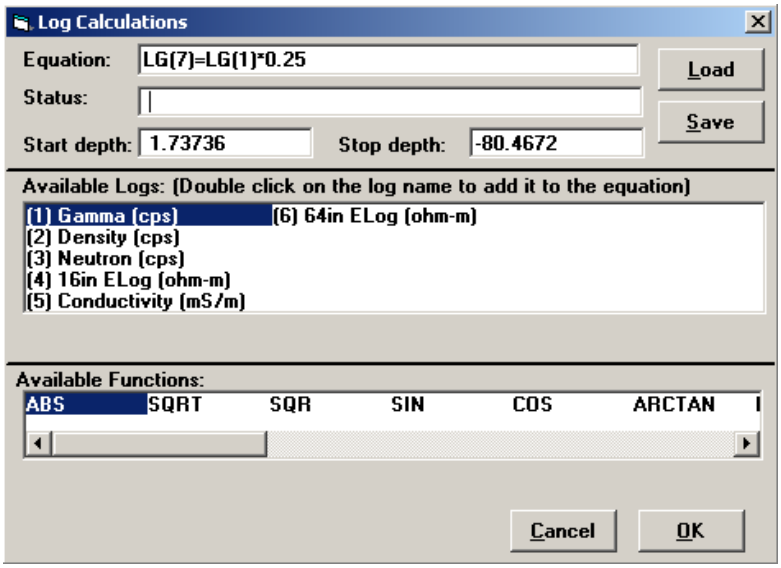
Equations are entered in a similar manner to a spreadsheet, with logs referenced as LG(x), where x is a valid log number. For example, to take the square root of log 4 plus log 5, and make log 6 the result, enter:

> LG(6) = sqrt(LG(4) + LG(5))

The equation can also be used to reprocess an existing log. For example, suppose an interval within log number 6 should be corrected by multiplying the log values within a zone by 2.5. This can be performed by first selecting the interval and then entering the following equation:

LG(6) = LG(6) * 2.5

Note: This will replace the log values in the selected interval with the corrected values, leaving the remainder of the well unchanged.



Log Calculations.

Before entering the **Log Calculations** dialog box, the depth interval over which the calculation will be performed is defined using a similar process to zooming in on the data.

Equation: The equation for processing, using the format described above. Additional example equations are provided by pressing the **Load** button.

Load: This option is used to load an existing equation from the file VIEWLOG.EQN.

Save: This option is used to save log equations in the ASCII file VIEWLOG.EQN. This file is always stored in the VIEWLOG program directory.

Start Depth: The depth at which the log calculation will start.

Stop Depth: The depth at which the log calculation will stop.

Status (Error Messages): One of a number of self-explanatory error messages (such as division by zero) may arise during the processing of the equation. If an error develops, the cursor will be placed at the position at which the error occurred in the equation, and the message will be printed above that point.

To interactively build an equation with the mouse, perform the following:

1. Enter the result log number, for example LG(8)=
2. Double click on the log name in the **Available Logs** list box. The Log reference number will be added to the Equation line.
3. Enter the operator (e.g., +-/*)
4. Double click on the desired function name in the **Available Functions** list box. The function, with the exception of the closing bracket, will be added to the equation line.

5. Repeat the above steps to complete the equation, adding operators and closing brackets as necessary.

Deviation

Under Construction.

Sonic Trace Window

Display window for full waveform sonic analysis.

Sonic First Break Pick

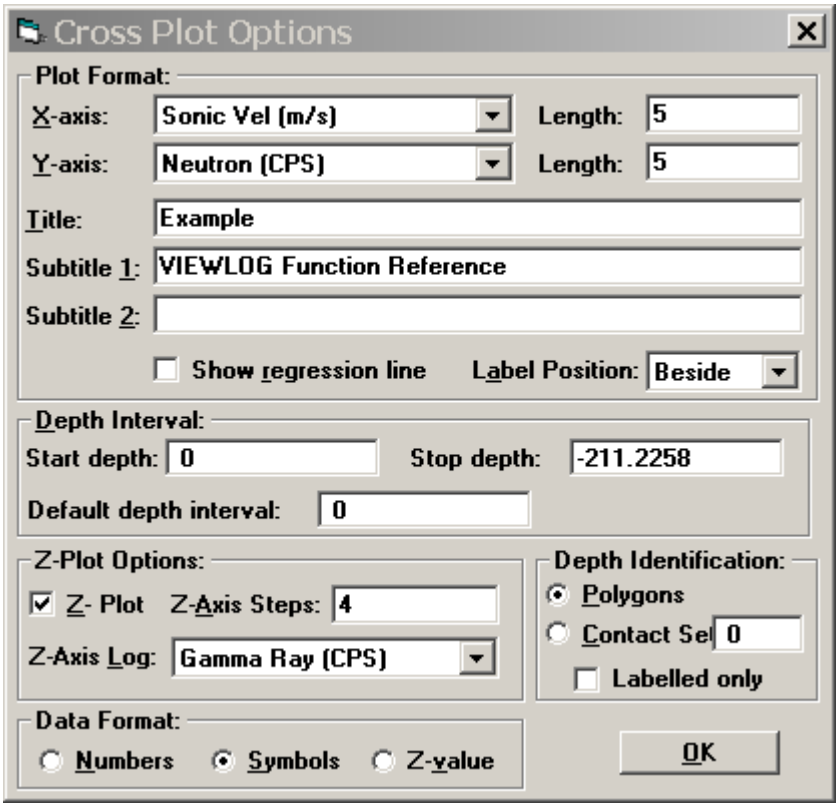
Define the depth interval for sonic first break pick analysis.

Sonic Transit Time

Calculate the sonic transit time.

XPlot Options

The Cross Plot Options window will generate a Cross plot of a single well, which must be currently displayed in the Log Editor.



Cross Plot Options.

Plot Format

X-Axis: Choose the log to be displayed on the A-Axis from the drop down menu.

Y-Axis: Choose the log to be displayed on the Y-Axis from the drop down menu.

Length: Chose the display length in cm for each axis.

Title: Type in the main title of the cross plot (optional).

Subtitle 1: Type in the subtitle for the cross plot (optional).

Subtitle 2: Type in the subtitle for the cross plot (optional).

Show regression line: If the box is checked on the cross plot will display the regression line on the cross plot. Below the cross plot the Slope, Intercept and R^2 will also be displayed.

Label Position: From the drop box the position of the labels can be controlled.

Depth Interval

Start depth: Starting depth of the log to be displayed on the cross plot.

Stop depth: Stop depth of the log to be displayed on the cross plot.

Default depth interval: A form of filtering the number of points displayed on the cross plot. A value of 0 (default) will display all the points on the log.

Z-Plot options

Z-Plot: When checked on the will display the log, as defined in the Z-axis log, to the right of the cross plot.

Z-Axis Steps: Number of divisions in the Z-Axis (a value of 4 is the default).

Z-Axis Log: Choose from the drop down menu the log to be displayed on the Z-Axis.

Depth Identification

Polygons: Displays the polygons

Contact Set: If checked on will read from the interpretation column from the log file. The Set number is defined from the ***Display*** menu (in **Format/**Display List) i.e. Set 1, Set 2.

Labelled only: Shows labels only.

Data Format

Numbers: Format of the Z-axis steps to be displayed on the cross plot, choosing numbers will display the number of the z-axis division on the cross plot.

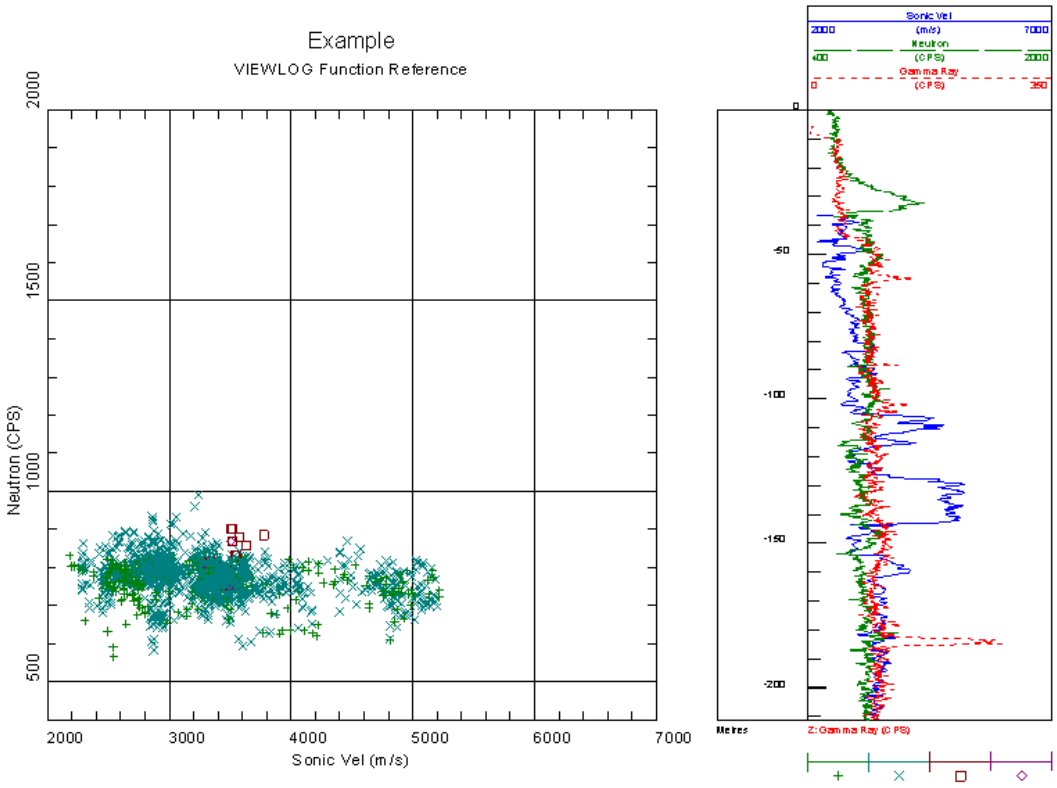
Symbols: Format of the Z-axis steps to be displayed on the cross plot, choosing symbols will display a symbol relative to the z-axis division on the cross plot.

Z-Values: Format of the Z-axis steps to be displayed on the cross plot, choosing Z-Values will display the value of the z-axis on the cross plot.

Create XPlot

Generates a 2D cross plot. See example below.

> **Note:** Selecting the options button from the menu bar will bring up the **Cross Plot Options** window. For a detailed description of the main menu bar (exception Options) please refer to the Multi-Well Window Commands.



Sample Cross Plot.

Statistics

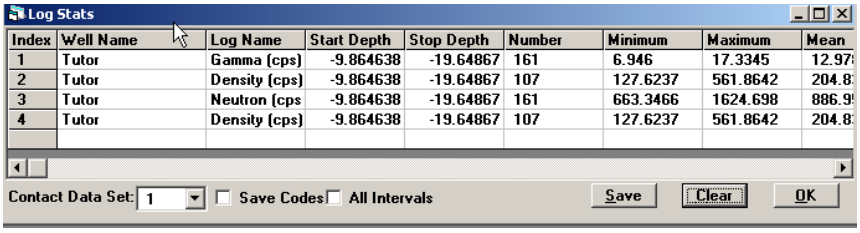
In the Log Editor, the **Interpret/*Statistics*** function is used to calculate log data statistics on any interval within a log. The function calculates the number of data points in the interval, the mean, standard deviation, slope, intercept, curvature and maximum and minimum log values. These values may be copied to the Windows clipboard and pasted into other applications.

Log Stats Window Options

1. **Contact Data Set**: The interpretation data set from which contact intervals will be selected is defined with this dropdown list box.
2. **Save Codes**: If save codes is enabled, special text messages are added to the interpretation data set. These codes will direct the program to display log stats lines on subsequent printer output. The **Show Stats** function in the Display Option tab of the **Format/**Page/Global Settings dialog box.
3. **All Intervals**: If enabled, all of the contact intervals encountered in that log will be processed and recorded in the Stats grid window.
4. **Save**: The save function can be used to copy the grid information to the Windows Clipboard. To copy the entire grid, simply click the **Save** button. To copy only a

portion of the grid results, first highlight the desired rows and columns, then click the Save button.

5. **Clear**: Clears the Log Stats grid window.



Log Statistics.

PROCEDURE:

1. Select **Interpret/*Statistics*** in the Log Editor
2. Click on the log for which you wish to calculate the statistics
3. The statistics on the selected interval are then calculated and printed in the **Log Stats** window.
4. Three vertical lines are also drawn on the interval. The centerline corresponds to the log mean, while the left and right lines are the one standard deviation limits. In addition, a sloping line, corresponding to a linear fit of the data, and a curved line, corresponding to a second order curvilinear regression, is also calculated.

> **Note:** If the log data is displayed with logarithmic scaling, the log statistics calculated are in base 10 log units, and a message indicating this is printed beside the results. Switching the scaling to linear before calculating the log statistics will give results in non-logarithmic units.

To calculate statistics for an interactive selection of depth interval:

5. The log interval can be interactively defined by clicking the left mouse button and dragging the mouse to define the range over which the stats will be calculated.

The statistics will be printed in the **Log Stats** window.

PCA

Allow for Principal Component Analysis of log data

Options Menu

Toolbar

In the Log Editor, the **Option/*Toolbar*** menu item controls the display of the screen toolbar. Uncheck this item to suppress the toolbar. Use of the toolbar is recommended, as important mouse scaling information is displayed beside the toolbar icons.

Status Line

In the Log Editor, the **Options/*Status line*** menu item controls the display of the status line. Uncheck the menu item to suppress the display of the status line.

Acquisition Control Menu

Lithology Symbols

See the Lithology Symbol Editor.

Choose Font

The Log Editor **Options/*Choose Font*** function allows the user to specify the font, font style and font size for the on-screen display of the log names and facies text.

About VIEWLOG

See About VIEWLOG.

Window Menu

Cascade

The **Window/*Cascade*** function arranges all windows in an overlapping manner, beginning in the upper left corner of the parent window.

Tile Horizontal

In both the Log Editor, the **Window/*Tile Horizontal*** function can be used to arrange all windows in horizontal panels within the parent window. For example, when editing two HDR files, the **Window/*Tile Horizontal*** command will split the screen horizontally in the center and place one log window above the other.

Tile Vertical

In both the Log Editor, the **Window/*Tile Vertical*** function can be used to arrange all windows in vertical panels within the parent window. For example, when editing two HDR files, the **Window/*Tile Vertical*** command will split the screen vertically in the center and place the two log windows side by side.

Arrange Icons

The **Window/*Arrange Icons*** command can be used to arrange the icons (representing minimized MDI forms) along the bottom of the VIEWLOG parent form.

Help Menu

Contents

In the Map Editor, the **Help/*Contents*** function opens up User's Guide for VIEWLOG in a new window. Cross-references are included, which can be used to get help on specific features in VIEWLOG.

Menu Commands

Display a list of VIEWLOG menu commands.

Using Help

Display instructions on how to use help.

VIEWLOG on the Web

http://www.viewlog.com/

About VIEWLOG

See About VIEWLOG.

MULTI-WELL WINDOW COMMANDS

File Menu

New Cross Plot

The **File/*New Cross Plot*** menu item can be used to create a new Cross Plot file (XPT file) in memory.

Open Plot Setup

The **File/*Open Plot Setup*** menu item is used to open an existing cross plot file (XPT extension).

Save

The **File/*Save*** menu saves the current cross plot file.

Save As

The **File/*Save As*** menu function allows the user to specify a new file name and directory into which the data will be written.

Close

The **File/*Close*** function closes the current Cross Plot window. It does not end the program. If the data in the window has changed, the program will request whether changes should be saved.

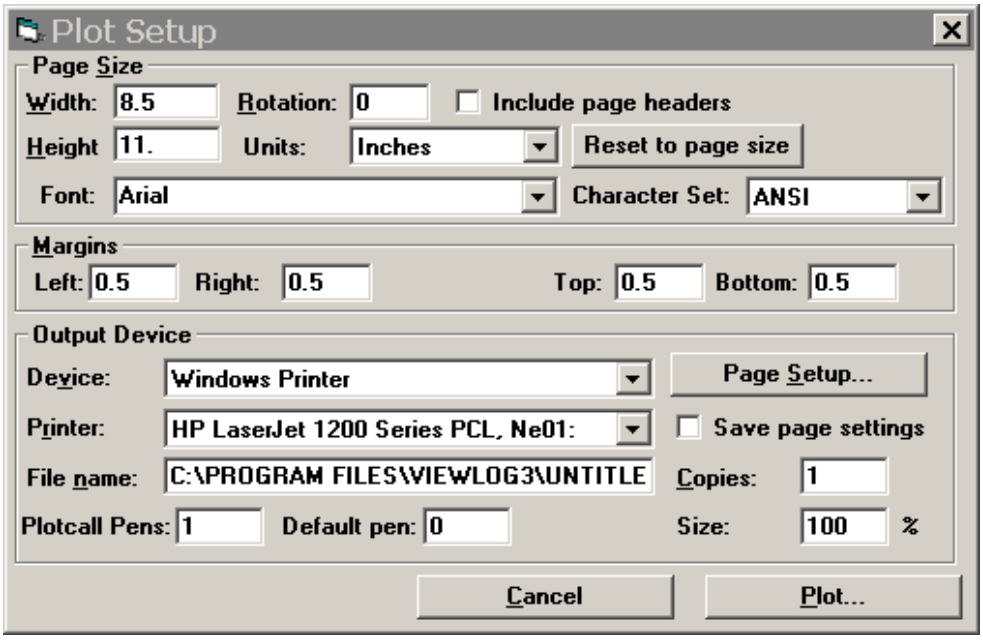
Export Data

Creates *.PRN file of the data selected in the Multi-Well Analysis Control menu displayed data.

Print

The **File/*Print*** menu item loads the **Plot Setup** window, which is used to create output on paper, and export images to another format.

The **Plot Setup** dialog box is shown below.



Plot Setup.

Page Size

Plot Width: This parameter controls the width of the plot. The plot width is the total width, in inches, of all the columns, including the left and right margins.

Plot Height: This parameter controls the overall height of the plot. The plot length includes the top and bottom margins, header text and log column length.

Rotation: This parameter controls the angle of rotation of the plot on the output page.

Reset to Page Size: This parameter controls the reset calculation: for example, if the plot width is set to 8.5 inches, and the **Reset to page size** function is selected, the program will calculate track spacings and text sizes for a width of 8.5 inches.

Units: Page size can be specified in inches or cm.

Font: The user can select the font that will be used for titles, labels and axes.

Margins

The **Left**, **Right**, **Top** and **Bottom** margins of the page.

Output Device Options

Device:: Enter the output device or image export file type. Devices include:

Windows Printer: Output to the default windows printer.

Windows Metafile: Output to a MS Windows Metafile.

VIEWLOG Drawing (as WMF): Used to convert the output into the Map Editor.

VIEWLOG Drawing: Not yet supported - use VIEWLOG Drawing (as WMF).

AutoCAD DXF file: Output to DXF format for AutoCAD.

Plotcall Binary and ASCII Files: Used to create Plotcall files - for compatibility with VIEWLOG for DOS.

Printer: Select from a list of installed printers.

File Name: Enter the name of the output file. The output file is used for DXF, WMF and Plotcall file output.

Page Setup: Click to enter the printer settings dialog box, from which page size and other aspects of the printer setup are controlled.

Copies: Number of complete copies of the plot generated by the printer.

> **Note:** Some printers cannot automatically generate multiple copies (depending on the printer driver). If the printer cannot generate multiple copies, the **Copies** value will be reset to 1 after entering the **Page Setup** dialog box.

Size: Relative size of the plot, in percent.

> **Note:** Some printers cannot automatically scale the plot size (depending on the printer driver). If the printer cannot use this size setting, the **Size** value will be reset to 100% after entering the **Page Setup** dialog box.

Save Page Settings: Check this box to make the **Page Setup** settings the default Windows settings. If left unchecked, changes to the **Page Setup** are only saved for the duration of the VIEWLOG session.

Plotcall pens, Default pen: Used for the Plotcall Binary and ASCII output device options.

Open Log File

The **File/*Open Log File*** menu item is used to open an existing log data file (HDR extension).

Open Log Database

This function allows for easy viewing of logs with user-defined templates as well as the Log Database Connection Setup Menu.

Please refer to **File/**Open Log Database in the Log Editor.

Open Drawing File

The **File/*Open Drawing File*** function is used to open an existing drawing file (MAP extension).

View Menu

Cancel Current Function

The **Edit/*Cancel*** current function (Shortcut: **F3**) cancels the current mouse.

Zoom In

The **View/*Zoom*** In function (Shortcut: **F4**) is used to enlarge the display of information on screen.

Zoom Out

The **View/*Zoom Out*** menu item (Shortcut: **F5**) increases the amount of information displayed on screen.

Zoom All

The **View/*Zoom All*** option (Shortcut: **F6**) sets the screen display so that all the available data, are displayed.

Zoom Last

The **View/*Zoom*** Last menu item (Shortcut: **F7**) sets the screen scaling parameters to those last used.

Pan

The **View/*Pan*** menu function (shortcut: **F8**) is used to shift the image to view a different portion of the image. Pressing and holding the left button and dragging the mouse either up or down the screen will shift the screen window. A line will appear while the mouse button is held down to indicate the pan movement and distance.

Update

The **View/*Update*** command (shortcut: **F8**) redraws the screen, refreshing the image display.

Identify Point

This command is used to identify a point value, location, lithology and hole ID on cross plot

Copy Metafile to Clipboard

The **View/*Copy metafile to clipboard*** function can be used to copy an image to the Windows clipboard. The image can then be pasted into popular word processors or other software packages.

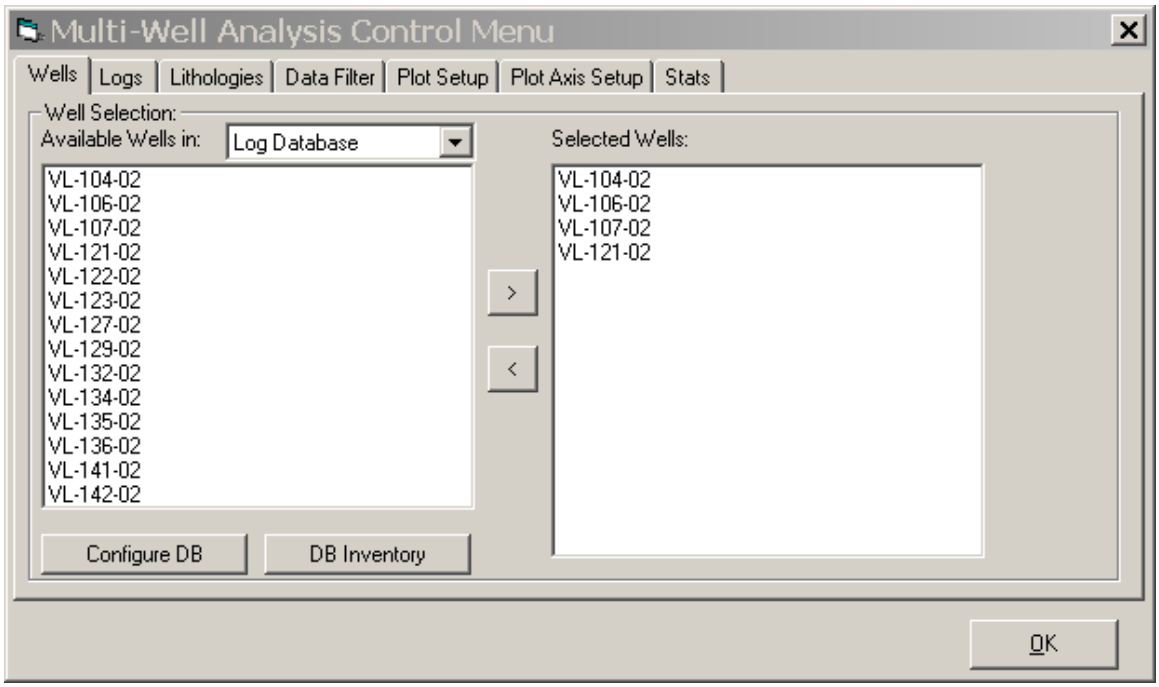
> **Note:** Images can only be copied to the clipboard if the user draws a box in **Page View** first.

Options Menu

Multi-Well Analysis Control Menu

Cross plots of two or more parameters, keyed to the geophysical lithoclasses give a visual check on the original geophysical boundary picks. The definition of a lithoclass is a UNIQUE grouping of measurements, as defined by a set of given geophysical parameters. The degree to which the class is unique, is established via visual discrimination from field plots and cross-referenced by cross plots.

Multi-Well Analysis Control Menu: Wells Tab



Multi-Well Analysis Control Menu – Wells Tab.

Well Selection:

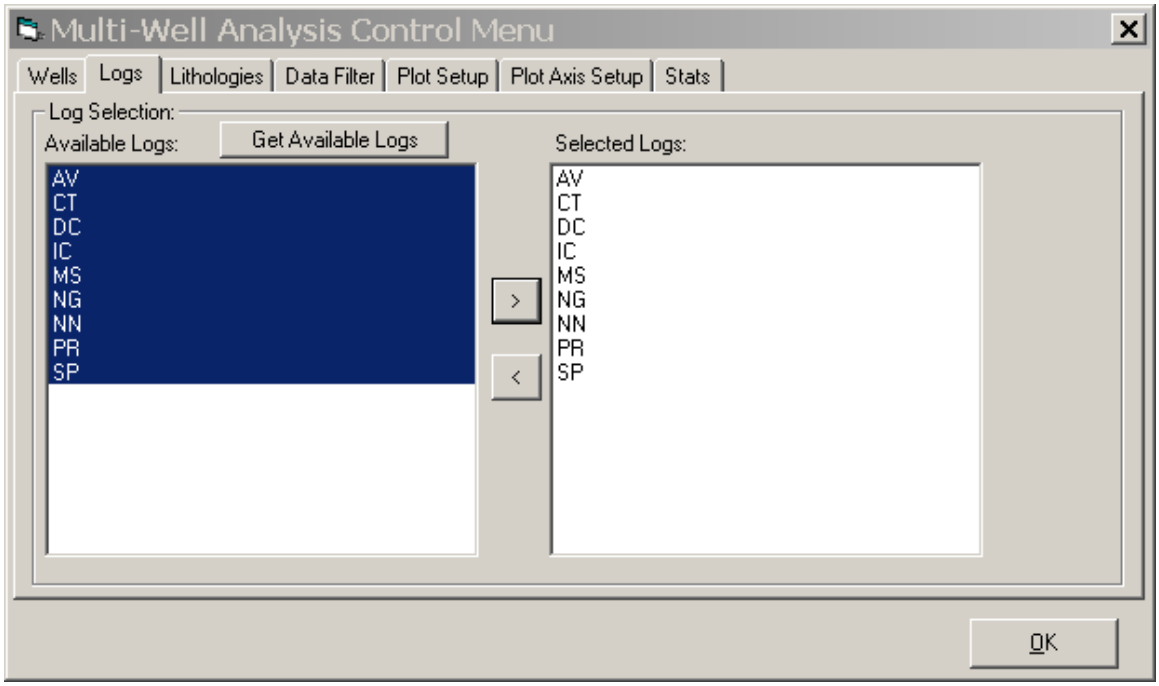
Available Wells in: From the drop down menu select the table where the geophysical logs are stored. The available well from the table will be displayed in the window

Selected Wells: Select, by dragging the mouse over the well names in the Available wells window and use the to transfer the wells the other window. These will be the wells which are displayed on the cross plot.

Configure DB: Opens the Log Database Connection Setup menu (See Log Database Connection Setup).

DB Inventory: Opens the **Log Database Inventory** menu.

Multi-Well Analysis Control Menu: Logs Tab



Multi-Well Analysis Control Menu – Logs Tab.

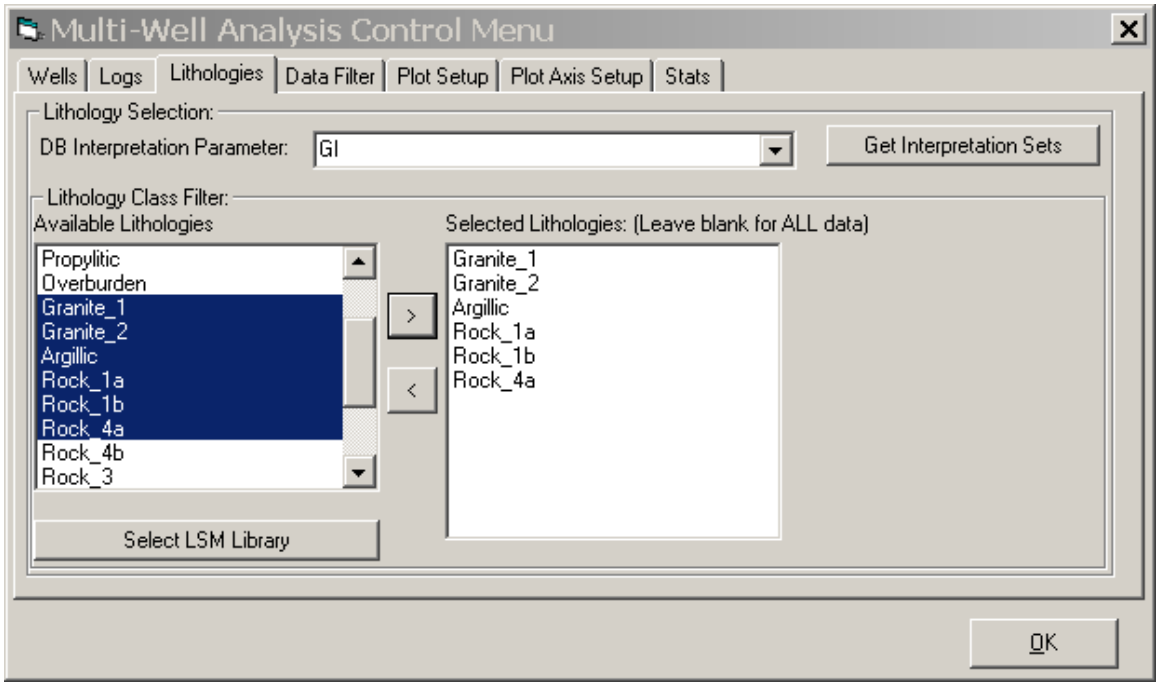
Log Selection

Available Logs: When selected will display the available geophysical parameters.

Get Available Logs: The user must click on this button to display the available geophysical logs.

Selected Logs: To select the geophysical parameters to be available to display on the cross plot. the user must first highlight the wells in the available log window then chose the > button to move the selected logs over.

Multi-Well Analysis Control Menu: Lithologies Tab



Multi-Well Analysis Control Menu – Lithologies Tab.

Lithology Selection

DB Interpretation Parameter: Displays from the drop-down menu the defined interpretation sets.

Get Interpretation Sets: The user must click on this button to connect to the database to get the interpretation set.

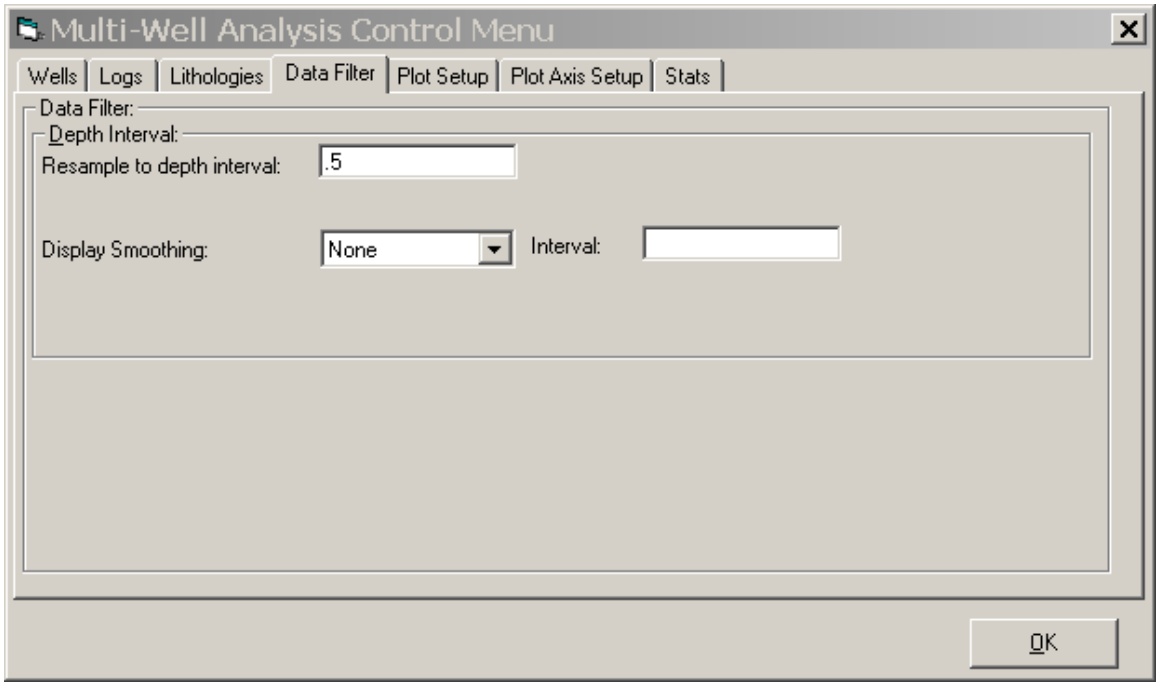
Lithology Class Filter

Available Lithologies: Shows the available lithologies.

Selected Lithologies: The user must first select the available lithologies by dragging the curser over the lithologies and highlighting them. Then clicking on the > button will transfer the lithologies to the other window. These selected lithologies will be displayed on the cross plot.

Select LSM Library: Selects the Lithology Symbol Editor.

Multi-Well Analysis Control Menu: Data Filter Tab



Multi-Well Analysis Control Menu – Data Filter Tab.

Data Filter

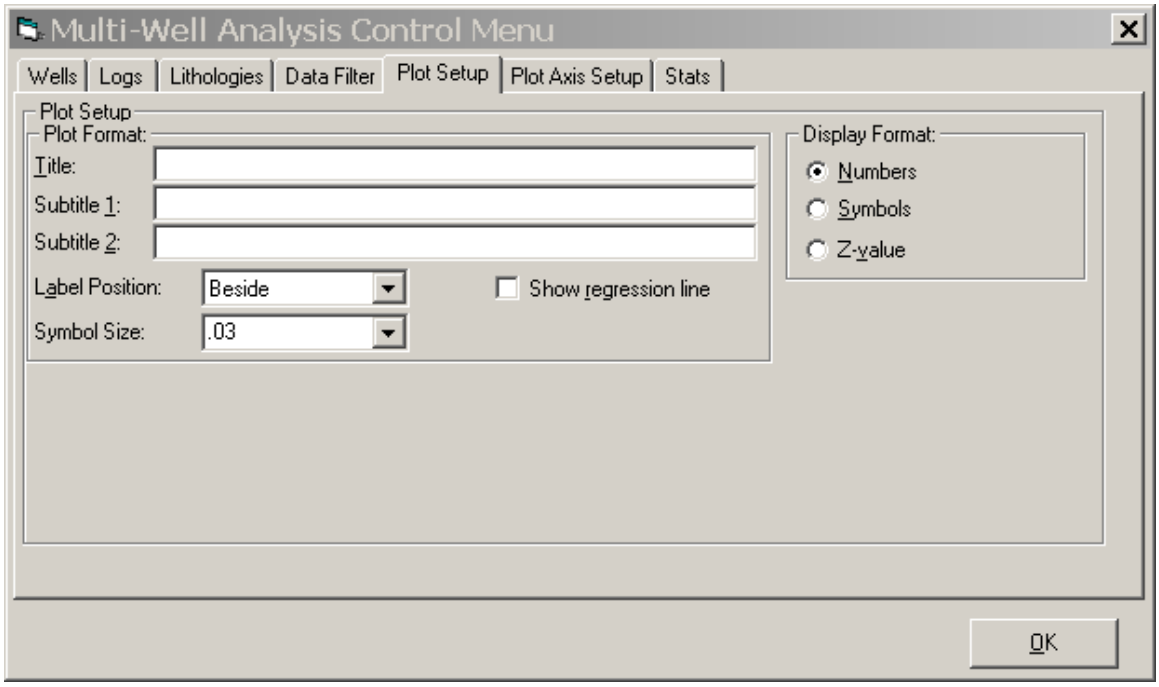
Depth Interval

Resample to Depth Interval: User-defined resample interval. This function simply drops points from the final display.

> **Note:** The performance of the 3D cross plot display will be greatly increased by entering in a resample interval.

Display Smoothing: From the drop-down menu the user can choose from: **Boxcar**, **Block** and **Tape**r filtering and can select the appropriate **Interval**.

Multi-Well Analysis Control Menu: Plot Setup Tab



Multi-Well Analysis Control Menu – Data Filter Tab.

Plot Setup

Plot Format

Title: Insert the main title to be displayed on the cross plot. (Optional)

Subtitle 1: Insert the subtitle title to be displayed on the cross plot. (Optional)

Subtitle 2: Insert the second subtitle title to be displayed on the cross plot. (Optional)

Label Position: Controls the initial position of the legend

Symbol Size: Controls the symbols size in the 2D cross plot

Show Regression line: Displays the regression line in the 2D cross plot.

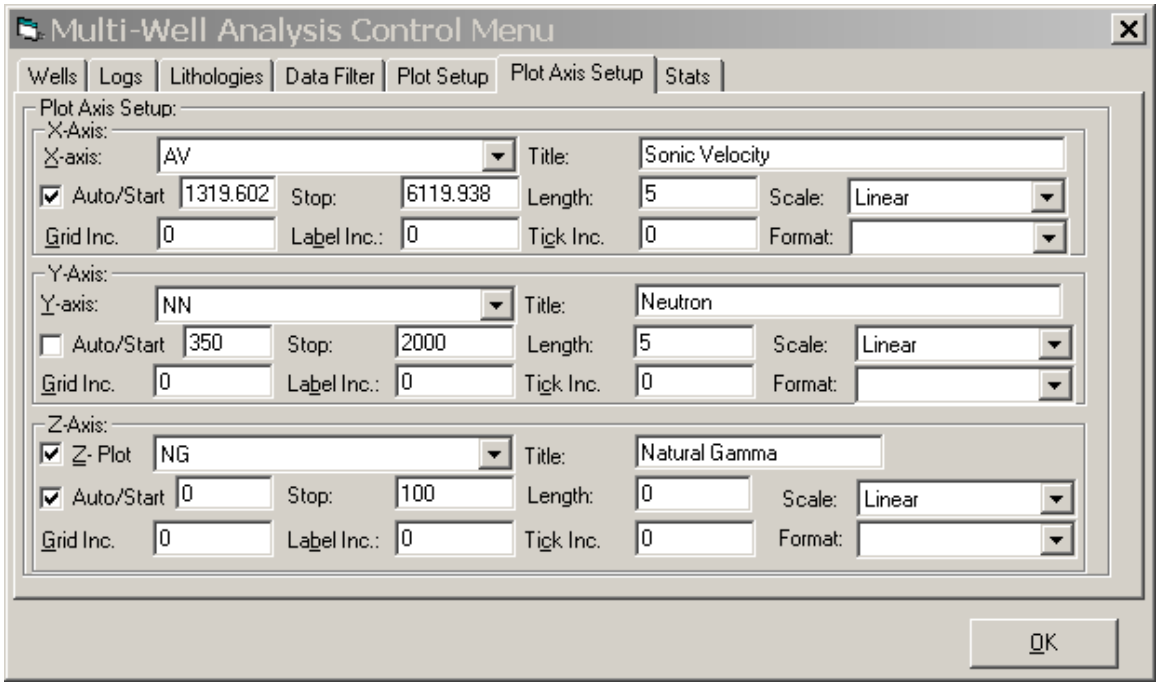
Display Format

Number: Under construction.

Symbols: Under construction.

Z-Value: Under construction.

Multi-Well Analysis Control Menu: Plot Axis Setup Tab



Multi-Well Analysis Control Menu – Plot Axis Setup Tab.

Plot Axis Setup

X-Axis

X-Axis: From the drop down menu chose the geophysical property to be displayed on the axis.

Auto/Start: If checked on the min value of the axis will be displayed. Alternatively the user can input an exact start value.

Stop: If **Auto/Start** is checked on the max value of the axis will be displayed. Alternatively the user can input an exact stop value.

Grid Inc.: User-defined grid increments.

Label Inc.: User-defined label increments.

Title: Title for the axis.

Length: Length of the axis (cm) displayed on screen.

Scale: From the drop-down menu choose either linear or logarithmic axis scaling.

Tick Inc.: User-defined tick increments.

Format: From the drop-down menu the user can select the number format.

Y-Axis

Y-Axis: From the drop down menu chose the geophysical property to be displayed on the axis.

Auto/Start: If checked on the min value of the axis will be displayed. Alternatively the user can input an exact start value.

Stop: If **Auto/Start** is checked on the max value of the axis will be displayed. Alternatively the user can input an exact stop value.

Grid Inc.: User-defined grid increments.

Label Inc.: User-defined label increments.

Title: Title for the axis.

Length: Length of the axis (cm) displayed on screen.

Scale: From the drop-down menu choose either linear or logarithmic axis scaling.

Tick Inc.: User-defined tick increments.

Format: From the drop-down menu the user can select the number format.

Z-Axis

Z-Axis: If checked on a 3D plot will be generated. From the drop down menu chose the geophysical property to be displayed on the axis.

Auto/Start: If checked on the min value of the axis will be displayed. Alternatively the user can input an exact start value.

Stop: If **Auto/Start** is checked on the max value of the axis will be displayed. Alternatively the user can input an exact stop value.

Grid Inc.: User-defined grid increments.

Label Inc.: User-defined label increments.

Title: Title for the axis.

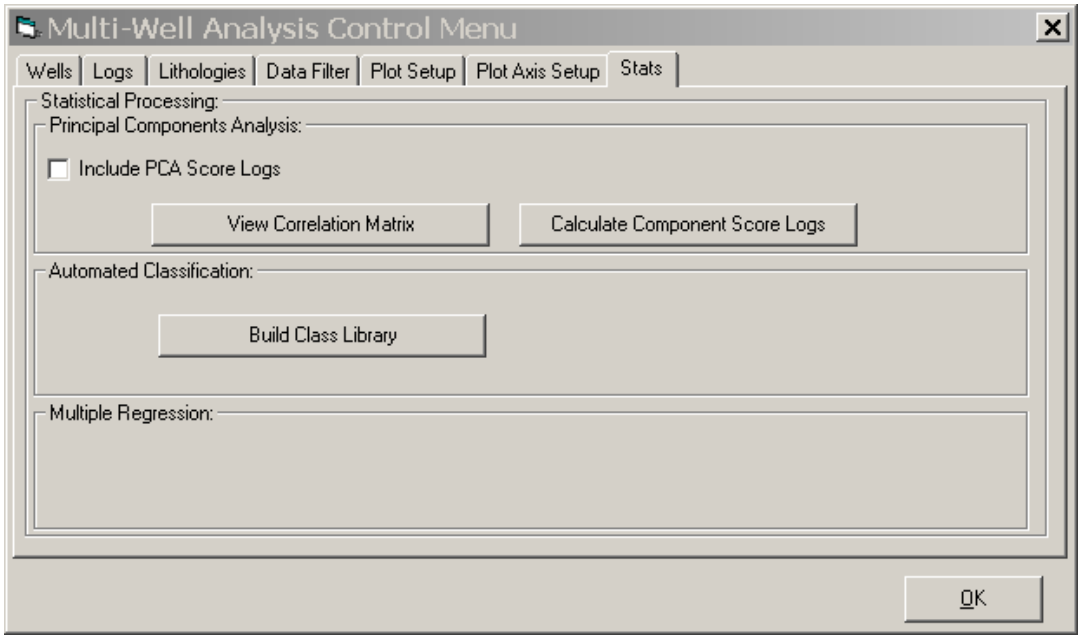
Length: Length of the axis (cm) displayed on screen.

Scale: From the drop-down menu choose either linear or logarithmic axis scaling.

Tick Inc.: User-defined tick increments.

Format: From the drop-down menu the user can select the number format.

Multi-Well Analysis Control Menu: Stats Tab



Multi-Well Analysis Control Menu – Stats Tab.

Statistical Processing

Principle Component Analysis

Include PCA Logs

Under Construction.

View Correlation Matrix

Under Construction.

Calculate Component Score Logs

Under Construction.

Automated Classification

Build Class Library: Generates a *.CLB file for Automated Classification.

Multiple regression

Under Construction.

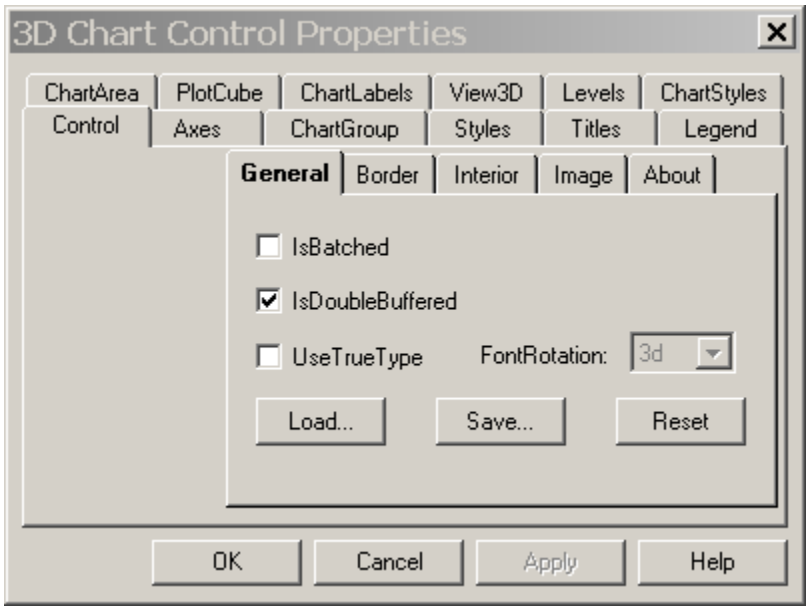
Regenerate Menu

Regenerate

Regenerates the cross plot.

3D Chart Control Menu

Right-click anywhere on the 3D Cross plot to display the **3D Chart Control Properties** menu.



3D Chart Control Properties.

Control Menu

The Control menu contents deal with general overlapping properties that are related to various charts. These properties include, loading and saving VIEWLOG Cross Plot, choosing border types, colors and attached images.

General Tab

IsBatched: Sets the **IsBatched** property so that it does not allow changes to the chart to be displayed on the screen.

IsDoubleBuffered: Sets the **IsDoubleBuffered** property so that it buffers changes, allowing images on the screen update as smoothly as possible.

UseTrueType: Sets the **UseTrueType** property so that the chart may utilize true type fonts within the Plot Cube.

Select a font rotation (**None**, **2d** or **3d**) to determine how **TrueType** fonts are rotated within the 3D plot cube.

Load…: Allows you to load previously created **ComponentOne** Chart description files. This feature allows you to reuse settings from previous charts.

Save…: Allows you to save the property settings as a **ComponentOne** Chart description file.

> **Note:** Pressing the **Reset** button removes the current settings.

Border Tab

Type: Allows you to choose one of the pre-set BorderType properties to be drawn around the entire chart. If this option is disabled, you cannot change the border type for this area.

Width: Allows you to set the width of the border in pixels.

Interior Tab

Background Color Area

RGB: Lists the RGB value of the of specified background. The ellipsis button next to the textbox opens the customized color palette.

Name: Lists the current color that is being used as a background by the active chart area.

Foreground Color Area

RGB: Lists the RGB value of the specified foreground (text). The button next to the textbox opens the customized color pallet.

Name: Lists the current color that is being used as a foreground by the active chart area.

Image Tab

File: Lists the current image (including path) used in the background of the chart. The button next to the textbox opens the browser to locate the image that you wish to use.

Layout: dropdown allows you to format the position of the image within the chart.

IsEmbedded: Sets the **IsEmbedded** property so that the image is embedded within the file rather than being linked to the chart.

HasMinimumSize: Sets the **HasMinimumSize** property so that the text area where the image is used will be sized according to the image.

IsTransparent: Sets the **IsTransparent** property so that the bitmap image is rendered as a transparent bitmap.

> **Note:** Pressing the **Reset** button removes the current image from the chart and clears the **File** textbox.

About Tab

The **About** tab displays information about the 3D chart control, including the version and serial number.

Axes Menu

This page allows you to modify the chart's axes. You can modify each axis by highlighting a specific axis in the left pane then choosing the inner tab and property you wish to change.

General Tab

IsShowing: Sets the **IsShowing** property so that the X-axis, Y-axis or Z-axis is visible.

Anno. Meth.: dropdown allows you to change how the axis in question is annotated.

> **Note:** You can use the **ValueLabels** tab to edit ValueLabels and the ChartGroup tab's **Labels** tab to edit DataLabels.

Origin: textbox allows you to specify where to place the origin for the Z-axis.

Scale Tab

Min: Allows you to specify the minimum value of the specific axis itself. When the **IsDefault** checkbox is checked, the chart automatically controls the minimum value for that axis.

Max: Allows you to specify the maximum value of the specific axis itself. When the **IsDefault** checkbox is checked, the chart automatically controls the maximum value for that axis.

Title Tab

Title: Allows you to specify a title for each of your axes.

TitleFont

Stroke: Allows you to specify the font type for all axes.

Size: Allows you to specify font size for all axes.

TrueType: Lists the true type font name and size being used by the axis text. The button to the right of the textbox opens the font browser.

GridLines Tab

IsOnXYPlane: Sets the **IsOnXYPlane** property so that a grid is placed on the XYPlane.

IsOnXZPlane Sets the **IsOnXZPlane** property so that a grid is placed on the XZPlane.

IsOnYZPlane: Sets the **IsOnYZPlane** property so that a grid is placed on the YZPlane.

GridStyle Tab

Pattern: Allows you to change the line pattern for each of the axes.

Width: Allows you to specify the thickness of the axis line.

Color Area

RGB: Lists the RGB value of the of the specified axis line. The ellipsis button next to the textbox opens the customized color pallet.

Name: Lists the current color that is being used by the axis line.

ValueLabels Tab

Add…: Adds a value label to the value label pane.

Remove: Removes the currently highlighted value label.

Value: Allows you to specify the label value.

Label: Allows you to enter or change the label text.

Font Tab

Stroke: Aallows you to specify the font type for the annotation.

Size: Allows you to specify font size for the annotation.

TrueType: Lists the font type and font size being used by the annotation. The button to the right of the textbox opens the font browser.

ChartGroup Menu

This page allows you to modify the ChartGroup.

General Tab

ChartType: Allows you to change the specific type of chart used for each **ChartGroup**.

IsContoured: Allows contour lines to be drawn on the chart, when checked.

IsMeshed: Allows mesh lines to be drawn on the chart, when checked.

IsZoned: Allows zone colors to be drawn on the chart, when checked.

IsShaded: Allows surface shading to be drawn on the chart, when checked.

IsTransparent: Allows the chart mesh to be transparent, when checked.

> **Note:** This property is displayed when the **IsShaded** property is not used.

ZoneMethod: Allows you to specify how to determine each zone region. Note This property is displayed when the **IsZoned** property is used.

Data Tab

Layout: Specifies the format of the chart data.

> **Note:** Changing **Layout** deletes any data displayed in the chart.

RowCount: Specifies the number of rows in the data grid.

ColumnCount: Specifies the number of columns in the data grid.

Load…: Allows you to load new elevation or contour data.

Save…: Allows you to save the current elevation or contour data to a file.

Enter Data…: Allows you to enter or edit data.

Edit Data…: Allows you to edit the 3D chart data in the Edit Chart 3D Data window.

Edit Row…: Allows you to edit the spacing delta between each row.

Edit Col…: Allows you to edit the spacing delta between each column.

Smooth…: Allows you to use a center-weighted averaging function to “smooth” the data.

Surface Tab

IsSolid: Allows the 3D surface charts to display a solid skirt around the data, when checked..

IsRowMeshShowing: If checked, the chart will display the row mesh when **ChartGroup IsMeshed** property is used.

IsColumnMeshshowing: If checked, the chart displays the column mesh when **ChartGroup IsMeshed** property is used.

RowMeshFilter: Specifies the amount to filter display of row mesh lines. When 0, the chart filters automatically. When greater than 0, the chart displays each n^{th} mesh line.

ColumMeshFilter: Specifies the amount to filter display of column mesh lines. When 0, the chart filters automatically. When greater than 0, the chart displays each n^{th} mesh line.

Labels Tab

Add: Allows you to add labels after the selected label in the pane.

Remove: Removes the selected label.

Text: Allows you to enter or edit the label text.

Elevation Tab

Color

RGB: Shows the RGB value of the mesh for a specific area highlighted in the pane. The button next to the textbox opens the customized color palette.

Name: Shows the current color that is being used by the area.

Internet Tab

Under Construction.

Styles Menu

The attributes that define how the contour lines and zoning colors look in a chart are called **ContourStyles**. This page lists the currently defined **ContourStyles** and allows you to modify them as required. You can modify each **ContourStyle** by highlighting a specific style in the left pane then choosing the inner tab and property you wish to change.

General Tab

Load…: Allows you to load a new set of **ContourStyles**, replacing the current **Styles**.

Save…: Allows you to save the current set of **ContourStyles** to a file.

ResetStyles: Allows you to reset all **ContourStyles** customizations and use the chart's 100 built-in **Styles**.

FillStyle Tab

Color Area

RGB: Shows the RGB value of the fill color. The button next to the textbox opens the customized color palette.

Name: Shows the current color that is being used as fill.

LineStyle Tab

Pattern: Allows you to change the line pattern style for the various chart areas.

Width: Allows you to specify the thickness of the actual chart area outlines.

Color

RGB: Shows the RGB value of the outline for a line. The button next to the textbox opens the customized color palette.

Name: Shows the current color that is being used by the line.

Titles Menu

General Tab

Adjust: Allows you to determine the alignment of multiple lines of text within the title (**Right**, **Left** or **Center**).

IsShowing: If checked, the chart title will be visible.

Label Tab

Text: Provides you with a place to enter and edit text for each label.

Location Tab

Left: Specifies the distance from the left edge of the chart to the header or footer in pixels. If this option is disabled, you cannot change the position of this area.

When selected (checked), the **IsDefault** checkbox causes the chart to automatically control the Left value.

Top: Specifies the distance from the top edge of the chart to the header or footer in pixels. If this option is disabled, you cannot change the position of this area.

When selected (checked), the **IsDefault** checkbox causes the chart to automatically control the Top value.

Width: Specifies the width of the header or footer area in pixels. If this option is disabled, you cannot change the width of this area.

When selected (checked), the **IsDefault** checkbox causes the chart to automatically control the Width value.

Height: Specifies the height of the header or footer area in pixels. If this option is disabled, you cannot change the height of this area.

When selected (checked), the **IsDefault** checkbox causes the chart to automatically control the Height value.

Border Tab

Type: Allows you to choose one of the pre-set **BorderType** properties to be drawn around the header or footer area. If this option is disabled, you cannot change the border type for this area.

Width: Allows you to set the width of the border in pixels.

Interior Tab

Background Color

RGB: Lists the RGB value of the specified background. The button next to the textbox opens the customized color palette.

Name: Lists the current color that is being used as a background by the active chart area.

Foreground Color

RGB: Lists the RGB value of the specified foreground (text). The ellipsis button next to the textbox opens the customized color palette.

Name: Lists the current color that is being used as a foreground by the active chart area.

Font Tab

Description: Shows the font type and font size being used by the header or footer text. The button to the right of the textbox opens the font browser.

Image Tab

File: Lists the current image (including path) used in the background of the header or footer. The ellipsis button next to the textbox opens the browser to locate the image that you wish to use.

Layout: Allows you to format the position of the image within the header or footer.

When selected (checked), the **IsEmbedded** checkbox allows the image to be embedded within the file rather than being linked to the chart.

When selected (checked), the **HasMinimumSize** checkbox allows the text area (header or footer) where the image is used to be sized according to the image.

When selected (checked), the **IsTransparent** allows the bitmap image to be rendered as a transparent bitmap.

Pressing the **Reset** button removes the current image from the header or footer and clears the **File** textbox.

Legend Menu

A Legend displays the visual attributes used for each series in scatter chart, with text that labels the series. This page lists the currently defined Legend and allows you to modify it as required.

General Tab

Anchor: Allows you to specify where the legend it positioned in relation to the **ChartArea**.

Orientation: dropdown allows you to specify the layout of the items in the Legend.

Type: dropdown allows you to specify whether to use a continuous or stepped legend style.

Range: dropdown allows you to set the legend range. If **Data** is selected, only the custom levels matching the data are shown in the legend. Otherwise, all levels are shown.

When selected (checked), the **IsShowing** checkbox allows the Legend to be visible.

Labels Tab

Add: Allows you to add labels to the legend.

Remove: Allows you to remove the selected label.

LabelFilter: Allows you to specify the label filter.

Location Tab

Left: Specifies the distance from the left edge of the chart to the legend in pixels. If this option is disabled, you cannot change the position of this area.

When selected (checked), the **IsDefault** checkbox causes the chart to automatically control the Left value.

Top: Specifies the distance from the top edge of the chart to the legend in pixels. If this option is disabled, you cannot change the position of this area.

When selected (checked), the **IsDefault** checkbox causes the chart to automatically control the Top value.

Width: Specifies the width of the legend in pixels. If this option is disabled, you cannot change the width of this area.

When selected (checked), the **IsDefault** checkbox causes the chart to automatically control the Width value.

Height:: Specifies the height of the legend in pixels. If this option is disabled, you cannot change the height of this area.

When selected (checked), the **IsDefault** checkbox causes the chart to automatically control the Height value.

Border Tab

Type: Allows you to choose one of the pre-set **BorderType** properties to be drawn around the legend area. If this option is disabled, you cannot change the border type for this area.

Width: Allows you to set the width of the border in pixels.

Interior Tab

Background Color

RGB: Shows the RGB value of the of the legend background. The button next to the textbox opens the customized color palette.

Name: Shows the current color that is being used as a background by the legend area.

Foreground Color

RGB: Shows the RGB value of the of the legend foreground (text). The button next to the textbox opens the customized color palette.

Name: Shows the current color that is being used as a foreground by the legend area.

Font Tab

Description: Shows the font type and font size being used by the legend text. The button to the right of the textbox opens the font browser.

Image Tab

File: Shows the current image (including path) used in the background of the legend. The button next to the textbox opens the browser to locate the image that you wish to use.

Layout: Allows you to format the position of the image within the legend.

When selected (checked), the **IsEmbedded** checkbox allows the image to be embedded within the file rather than being linked to the chart.

When selected (checked), the **HasMinimumSize** checkbox allows the area where the image is used to be sized according to the image.

When selected (checked), the **IsTransparent** checkbox allows the bitmap image to be rendered as a transparent bitmap.

> **Note:** Pressing the **Reset** button removes the current image from the legend and clears the **File** textbox.

ChartArea Menu

The **ChartArea** is the section of the chart that contains the chart elements including the graphic representation of the date, the axes and axes titles. This page lists the currently defined properties for the **ChartArea** and allows you to modify them as required.

Location Tab

Left: Specifies the distance from the left edge of the chart to the chart area in pixels. If this option is disabled, you cannot change the position of this area.

When selected (checked), the **IsDefault** checkbox causes the chart to automatically control the **Left** value.

Top: Specifies the distance from the top edge of the chart to the chart area in pixels. If this option is disabled, you cannot change the position of this area.

When selected (checked), the **IsDefault** checkbox causes the chart to automatically control the **Top** value.

Width: Specifies the width of the chart area in pixels. If this option is disabled, you cannot change the width of this area.

When selected (checked), the **IsDefault** checkbox causes the chart to automatically control the **Width** value.

Height: Specifies the height of the chart area in pixels. If this option is disabled, you cannot change the height of this area.

When selected (checked), the **IsDefault** checkbox causes the chart to automatically control the **Height** value.

Border Tab

Type: Allows you to choose one of the pre-set **BorderType** properties to be drawn around the chart area. If this option is disabled, you cannot change the border type for this area.

Width: Allows you to set the width of the border in pixels.

Interior Tab

Background Color Area

RGB: Shows the RGB value of the of the chart area background. The button next to the textbox opens the customized color palette.

Name: Shows the current color that is being used as a background by the **ChartArea**.

Foreground Color Area

RGB: Shows the RGB value of the chart area foreground (text). The button next to the textbox opens the customized color palette.

Name: Shows the current color that is being used as a foreground by the **ChartArea**.

Interior Tab

Background Color

RGB: Shows the RGB value of the of the chart area background. The button next to the textbox opens the customized color palette.

Name: Shows the current color that is being used as a background by the **ChartArea**.

Foreground Color

RGB: Shows the RGB value of the of the chartarea foreground (text). The button next to the textbox opens the customized color palette.

Name: Shows the current color that is being used as a foreground by the **ChartArea**.

PlotCube Menu

Not Available

ChartLabels Menu

A **ChartLabel** is a text label that displays in front of the chart data. This page lists the currently defined properties for the **ChartLabels** and allows you to modify them as required. You can modify each label by highlighting the specific item in the left pane then choosing the inner tab and property you wish to change.

To add a new label, press the **Add…** button and type the desired label text in the **Add Label** textbox that appears, then press **OK**. To remove a label, simply highlight the label you wish to delete and press the Remove button.

General Tab

When selected (checked), the **IsShowing** checkbox allows that the **ChartLabel** is visible.

When selected (checked), the **IsConnected** checkbox allows a line to be drawn from the chartlabel to its attachment point.

Name: Provides a place to modify the name of each label.

Adjust: Allows you to specify how to align multiple lines of text in the selected chartlabel.

Plane: Allows you to specify the plane to face the **ChartLabel**, when attached by **DataIndex** or **DataCoordinates**.

Attach Tab

AttachMethod…: Allows you to modify the how the **ChartLabel** is attached in the **Select Attach Method** window.

Offsets

Horizontal: Specifies the horizontal distance between the **ChartLabel** and its attachment point.

Vertical: Specifies the vertical distance between the **ChartLabel** and its attachment point.

> **Note:** By utilizing the **Select Attach Method** window, **ChartLabels** can be attached to screen **Coordinates**, **DataCoordinates**, or a **DataIndex**.

Label Tab

Text: Provides you with a place to enter and edit text for each chartlabel.

Border Tab

Type: Allows you to choose one of the pre-set **BorderType** properties to be drawn around the **ChartLabel**. If this option is disabled, you cannot change the border type for this area.

Width: Allows you to set the width of the border in pixels.

Interior Tab

Background Color

RGB: Shows the RGB value of the of the chartlabel background. The button next to the textbox opens the customized color palette.

Name: Shows the current color that is being used as a background by the **ChartLabel**.

Foreground Color

RGB: Shows the RGB value of the of the chartlabel foreground (text). The button next to the textbox opens the customized color palette.

Name: Shows the current color that is being used as a foreground by the **ChartLabel**.

Font Tab

Stroke: Allows you to specify the font type for the chartlabel.

Size: Allows you to specify font size for the chartlabel.

TrueType: Shows the font type and font size being used by the **ChartLabel**. The button to the right of the textbox opens the font browser.

Image Tab

File: textbox lists the current image (including path) used in the background of the chartlabel. The ellipsis button next to the textbox opens the browser to locate the image that you wish to use.

Layout: dropdown allows you to format the position of the image within the chartlabel.

When selected (checked), the **IsEmbedded** checkbox allows the image to be embedded within the file rather than being linked to the chart.

When selected (checked), the **HasMinimumSize** checkbox allows the area where the image is used to be sized according to the image.

When selected (checked), the **IsTransparent** checkbox allows the bitmap image to be rendered as a transparent bitmap.

Pressing the **Reset** button removes the current image from the chartlabel and clears the **File** textbox.

View3D Menu

This page lists the currently defined properties for the 3D Effects and allows you to modify them as required.

General Tab

Perspective: Specifies the amount of perspective by adjusting the "vanishing point" for each plane.

XRotation: Specifies the rotation angle of the X-axis in degrees.

YRotation: Specifies the rotation angle of the Y-axis in degrees.

ZRotation: Specifies the rotation angle of the Z-axis in degrees.

Levels Menu

This page lists the currently defined properties for the chart **ContourLevels** and allows you to modify them as required.

To add a new Contour Level, press the **Add…** button and type the desired level value in the **Add Contour Level** textbox that appears, then press **OK**. To remove a level, simply highlight the level you wish to delete and press the **Remove** button.

General Tab

When selected (checked), the **IsDefault** checkbox allows the chart to use its own linear distribution table.

Levels: Specifies the number of contour levels. If this option is disabled, the distribution table has been customized, so you cannot change the number of levels.

Load…**:** Allows you to load a new set of **ContourLevels**, replacing the current levels.

Save…**:** Allows you to save the current set of **ContourLevels** to a file.

ChartStyles Menu

The group of attributes that define how a series of data looks in the chart is called a **ChartStyle**. This page lists the currently defined **ChartStyles** and allows you to modify them as required. You can modify each **ChartStyle** by highlighting a specific style in the left pane then choosing the inner tab and property you wish to change.

To add a new style, press the **Add…** button. To remove a level, simply highlight the style you wish to delete and press the **Remove** button.

LineStyle Tab

Pattern: Allows you to change the line pattern style for the various chart areas.

Width: Allows you to specify the thickness of the lines in pixels.

Color Area

RGB: Shows the RGB value of the line color. The button next to the textbox opens the customized color palette.

Name: Shows the current color that is being used by the line.

SymbolStyle Tab

Shape: Allows you to change the data marker symbol for the scatter charts.

Size: Allows you to specify the size of the data marker symbol.

Color Area

RGB: Shows the RGB value of the data marker symbol. The button next to the textbox opens the customized color palette.

Name: Shows the current color that is being used by the data marker symbol.

Interpret Menu

Add Polygon

Under Construction.

Delete Polygon

Under Construction.

Delete All Polygons

Under Construction.

Window Menu

Cascade

The **Window/*Cascade*** function arranges all windows in an overlapping manner, beginning in the upper left corner of the parent window.

Tile Horizontal

The **Window/*Tile Horizontal*** function can be used to arrange all windows in horizontal panels within the parent window. For example, when editing two HDR files, the **Window/*Tile Horizontal*** command will split the screen horizontally in the center and place one window above the other.

Tile Vertical

The **Window/*Tile Vertical*** function can be used to arrange all windows in vertical panels within the parent window. For example, when editing two HDR files, the tile **Window/*Tile Vertical*** command will split the screen vertically in the center and place the two windows side by side.

Arrange Icons

The **Window/*Arrange Icons*** command can be used to arrange the icons (representing minimized MDI forms) along the bottom of the VIEWLOG parent form.

VIEWLOG Webserver

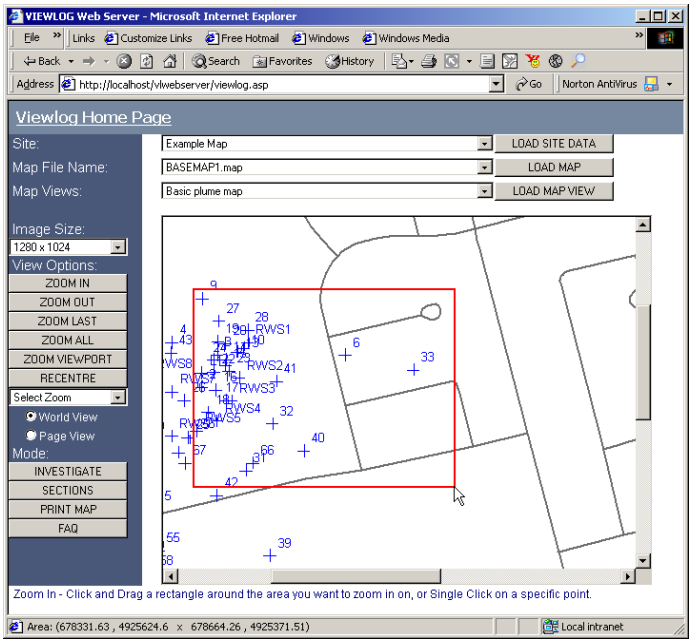
Overview, installation and instruction guide for the VIEWLOG Webserver

VIEWLOG WEBSERVER

Introduction

The VIEWLOG Web Server (VWS) allows a user to publish any VIEWLOG project to the web via a set of web pages. Minimal configuration of the VIEWLOG project is required as the web page and VIEWLOG Engine draws the components it needs directly from the same VIEWLOG project files that the user works on day to day. The VIEWLOG Web Server is simply a powerful browsing tool for an existing project that allows any individual with a web browser to:

- View any basemap or pre-defined cross section maps (*.map files)
- Load any existing map views
- Zoom, pan, recentre, etc all maps
- Click on map locations (eg. wells) and display their properties and logs
- Generate a two point cross section anywhere on the basemap
- Create a 'page' view of any current map to display a predefined legend, borders, title block etc.



Sample VIEWLOG Server Home Page

Software Description

The VIEWLOG Web Server consists of three components:

- **The VIEWLOG Engine**. A full version of VIEWLOG gets installed on the same computer that will host the web pages (i.e., has IIS install).

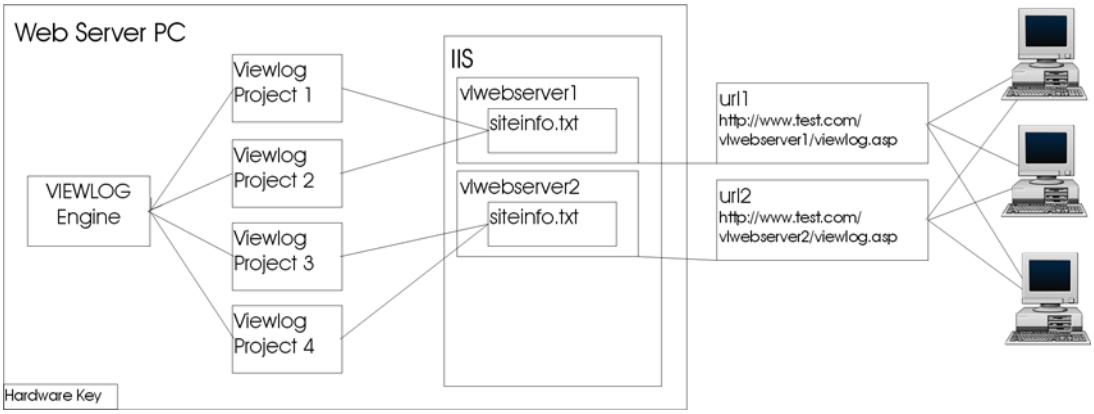
- **VIEWLOG Hardware Key**. The computer that hosts the web pages requires the VIEWLOG hardware key to unlock the required server functions.
- **VIEWLOG Web Pages**. A directory of web pages (including *.asp, *.htm, *.css etc) that manages the content that the internet user will see and are designed to run from Microsoft Internet Information Services (IIS) 4.0 and up.
- Please note that throughout this document that the term 'VIEWLOG Web Server' refers to all three components listed above.

Overview

This chapter of the manual covers some general information regarding the setup and usage of the VIEWLOG Web Server on the Web Server PC. It is meant to provide overall concepts of the general setup of VIEWLOG and how it links with internet users.

General Setup

The various components involved in the VIEWLOG Web Server system can be depicted in the following diagram. Additional detail is provide throughout the manual, but you may want to refer back to this diagram periodically.



VIEWLOG Web Server Diagram

Web Server PC

The web server PC hosts IIS and the VIEWLOG Engine. It stores all the VWS web pages and can also store all the VIEWLOG Projects that are to be published to the web. The VIEWLOG Hardware Key is also attached to this machine.

VIEWLOG Engine

The VIEWLOG Engine is installed on the Web Server PC. This version installed is actually the same as that used on desktops, however, the Hardware Key unlocks the web server functionality.

VIEWLOG Hardware Key

The Hardware Key physically plugs into the back of the Web Server PC. This key allows the VIEWLOG software to work with the web server pages.

VIEWLOG Projects

VIEWLOG Projects include *.map, *.hdr, *.grd and all the other files that go with a VIEWLOG project. When the VIEWLOG Engine creates maps for the web, it looks to the appropriate VIEWLOG Project directory for the required information.

Internet Information Services is a Microsoft product that is required to 'serve up' web pages.

Vlwebserver Directories

Vlwebserver is the default directory name for the VIEWLOG web pages. It is the structure of directory and files that make up the VIEWLOG web server pages.

SiteInfo.txt

There is a SiteInfo.txt file in every vlwebserver directory. This file is used by the web pages to point to the location of the VIEWLOG Project directories. It is a very simple structure that the webmaster can edit that contains the path to the web projects.

URLs

The URL can be accessed by internet and intranet users on their local PC's. It is up to the webmaster to create URL addresses and decided what should be public and secured.

Internet Users

Client computers are any computer other than the PC Web Server. These can be both intranet or internet users and can access the VWS pages by typing in the URL above.

Browser Compatibility

The web pages produced by the VWS are currently compatible with all Netscape 4.0+ and Internet Explorer 4.0+ browsers. Other browsers may work as well, however, VIEWLOG has not been fully tested on these browsers.

Software Updates

Updates of the VIEWLOG Engine can be downloaded anytime from the VIEWLOG website. The full version is always available for download as it is the hardware key that unlocks the web server functionality.

Updates of the VIEWLOG Web Page files are currently provided as a passworded zip files. Because the file size is so small, the zip is simply emailed to the user when they become available.

Check the website often for current version numbers. CD versions can always be requested by contacting VIEWLOG directly.

Installation – VIEWLOG Engine

Included in this section is a checklist of things to review before installing the VIEWLOG engine. This will insure that your installation goes smoothly and you are up and running immediately. The installation procedure for the VIEWLOG engine is very similar to that of most software products that run under Windows.

Software Installation

The installation of VIEWLOG is fully automated. The process begins as follows:

1. Start Windows. Choose step 2 i, ii, or iii as appropraite.
   a. Choose the appropriate option.
2. If starting with a CDROM that contains a setup menu:
   a. Insert the CDROM and wait for the installation menu to appear, or, Click on the Start button on the Windows task bar and select Run
3. At the prompt, type the following command line:
   d:\setup
   ...then click OK. (Substitute the correct drive letter if d: is not your CDROM drive).
   a. If starting with a CDROM that does not have a setup menu, search for the VLW2.exe or VLW2patch.exe file on the CD. Double click on the executable.
   b. If starting with a downloaded installation executable, double click on the VLW2.exe or VLW2patch.exe file.

The Installation Setup Menu screen appears, follow the prompts to proceed with the installation.

Windows NT, 2000 and XP

Prior to the installation of VIEWLOG under Windows NT, 2000 or XP it is necessary to log on with Administrator privileges.

Installation of Advanced Database Drivers

Prior to the operation of the database versions of VIEWLOG it may be necessary to install updated Microsoft Windows COM Components and database drivers. These installation options are only necessary if you wish to connect directly to databases other than Microsoft Access (eg. Oracle or SQLServer).

These free Microsoft software components are provided directly from Microsoft, or available on the VIEWLOG website.

They include:

- DCOM98 (Distributed Component Object Model)

This option is necessary for advanced database connection under Windows 95 and 98 only. This must be installed prior to MDAC.

- MDAC (Microsoft Data Access Components)

This set of drivers must be installed for Oracle, ODBC and SQL-Server access.

VIEWLOG Hardware Key Installation

To run the VIEWLOG program in a fully operational server mode the Hardware Key must be plugged into the computer. Both parallel and USB versions of the key exist. The type of key is chosen upon ordering but can be switched to the other version at any time by contacting VIEWLOG.

During the VIEWLOG installation the Activator Key Driver Installation program is automatically run. In most cases, simply select the "Express" button to install the key drivers.

Parallel Key Considerations

If using the parallel key, any printer cable can be plugged into the other end of the software key. The key will not interfere with the operation of the printer or print spooler. It is not necessary that a printer be installed for the key to operate.

By default, the key must be plugged into parallel port 1, however, to change port or any other key settings, run the "VIEWLOG Key Utility" program in the VIEWLOG 2 folder on the Start Menu. Additional instructions are found in the ReadMe files located in the \VIEWLOG 2\SSIKey directory.

Starting VIEWLOG

Once VIEWLOG is installed, a Windows Program Manager Group will be created containing the VIEWLOG 2 program icon. To start the program simply Select the VIEWLOG 2 Menu Item from the Start Menu.

Using VIEWLOG

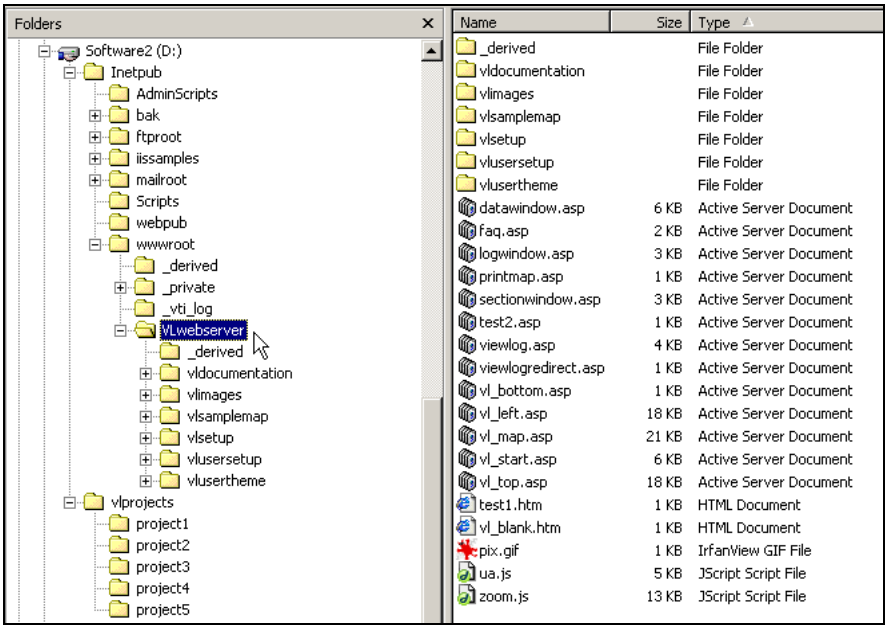
As the user interface of the web server version of VIEWLOG is identical to that of a regular client version, details of using and operating VIEWLOG can be found in the VIEWLOG User Manual, also on this CD or available from the VIEWLOG website.

Installation – VIEWLOG Web Pages

The VIEWLOG web pages are a directory of files (including *.asp, *.htm, *.css etc) that are simply copied into a sub directory of the root web folder on the computer running IIS. This directory can be duplicated into as many subdirectories as is necessary to provide any number of different url addresses to meet the needs of the client.

Web Server Directory Structure

The windows directory structure of a typical VWS setup is shown below:



VIEWLOG Webserver Directory Structure

A description of all the key directories can be found below. Further descriptions of the pertinent files are provided later.

Inetpub

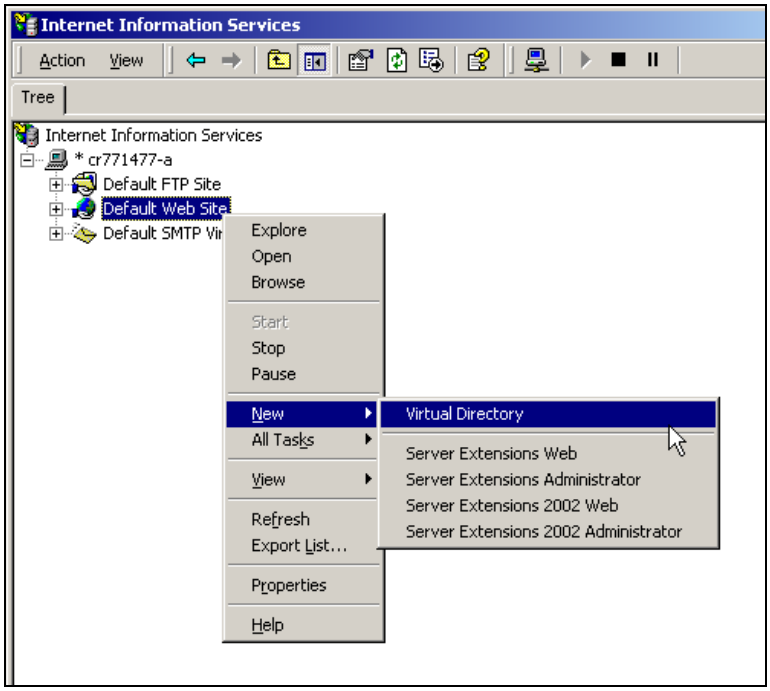
The Inetpub directory gets installed automatically when IIS is installed. The actual drive that Inetpub will appear under (eg. C: or D: etc) will depend on your particular Windows setup. The root drive letter is unimportant.

wwwroot

The wwwroot directory also gets installed automatically when IIS is installed. All web pages hosted by this machine are located in a subdirectory of wwwroot with the exception of 'virtual directories' which can be mapped to any directory that this computer has access to.

vlwebserver

This is the default name of the directory that ships with VWS. This directory can be renamed but no files or folders within it can be. In the scenario shown above, the vlwebserver directory is a subdirectory of wwwroot. In many cases, the vlwebserver is moved to another location on the PC and this directory is mapped to the web server as a 'virtual directory' using the IIS manager. An example is shown below:



Webserver Virtual Directory using IIS Manager

vlprojects

VIEWLOG Projects can be stored in any folder that the web server machine has access to. In the above scenario each project is placed in a subdirectory of the vlproject directory.

Web Structure Breakdown – vlwebserver Files

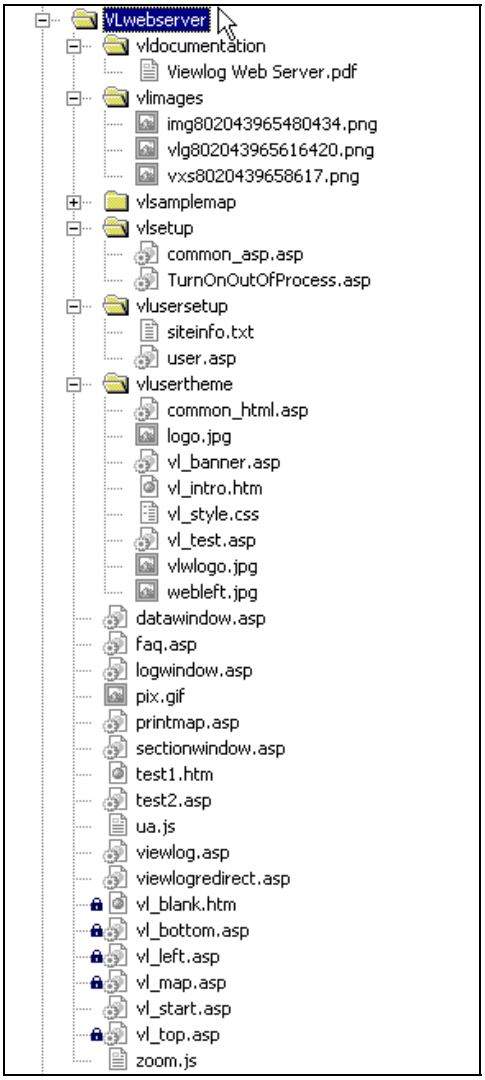
Files included in the VWS web directory are shown below. If a file is not specifically mentioned, it should be assumed that this file is for the VWS only and should not be altered.

vldocumentation

The vldocumentation folder contains this document and any 'late breaking' news concerning the current version of the VWS.

vlimages

The vlimages directory stores images generated by the VIEWLOG engine such as maps, cross sections and log files. These images are created as either *.png files or *.jpg files depending on whether internet explorer or netscape is used.



VIEWLOG Webserver Structure Breakdown

A new file is created by the VL Engine for each image (map, log, cross section etc) that is requested by the internet user. A unique name is created each time to avoid conflicts with concurrent users as well as multiple copies of the web server pages running from the same internet user.

vlsamplemap

The vlsamplemap directory contains a sample VIEWLOG project. This project can be used to test VL web pages.

vlsetup

The vlsetup directory contains files necessary to get the VWS web pages running on the web server

TurnOnOutOfProcess.asp

The VIEWLOG Engine needs to run Out Of Process in order to function properly. There is an IIS web server variable called AllowOutOfProcess that is 'true' by default in IIS 5 but 'false' by default in IIS 4. User's running IIS 4 can set this variable to true by running this asp page in a web browser

vlusersetup

The vlusersetup directory contains files that can be configured by the webmaster.

Siteinfo.txt

Siteinfo.txt is required to link the VWS web pages with the VIEWLOG engine. It is a simple text file containing the paths to the VL project directories. The file also contains instructions on how to edit the file.

user.asp

User.asp is an empty asp page that can optionally be used to run specific VB scripts prior to display of any of the VWS web pages. It is already linked into the VL web pages. For example, it could be used to perform a custom security check on the current user. The webmaster can add any necessary code this file at their own discretion.

vlusertheme

The vlusertheme directory is used by the webmaster to customize the appearance and 'branding' of the VWS pages. Colors, fonts, banners etc. can all be changed here. Please note if an option you wish to change can't be located within this folder, please contact VIEWLOG and we will be happy to work with you to properly expose that feature to this directory. Otherwise, you may lose your changes when web pages are upgraded.

vlintro.htm

vlintrol.htm is the first page that internet users see when they access the web pages. By default, this page contains the VIEWLOG logo and some instructions on getting started.

vlbanner.asp

vlbanner.asp contains html that the webmaster wants to show at the top of the VIEWLOG web pages.

vl_style.css

This is a cascading style sheet (css) that controls the look of the fonts, colours and button sizes on the VIEWLOG web pages.

vlwlogo.jpg

vlwlogo.jpg is the VIEWLOG 'V' logo that appears on the first page.

logo.jpg

logo.jpg is by default a white box image. This image appears on the first page (vlintro.htm) but cannot be seen because it is white. The webmaster could replace this file with their own logo called logo.jpg and it will appear on the first page.

webleft.jpg

webleft.jpg is the coloured bar at the left side of the web pages. It is blue by default.

vlwebserver

vlwebserver is the default directory name for all of the web pages. In the root of this folder are also the main VIEWLOG web pages.

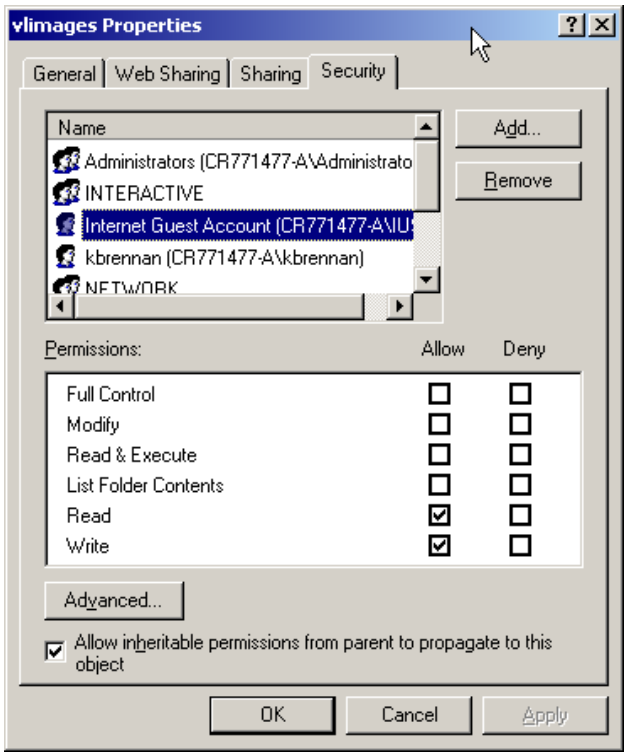
VIEWLOG.asp

VIEWLOG.asp is key page that ties all of the VIEWLOG web pages together. This is the page that a internet user will need to hit in order to activate the VIEWLOG web server.

Configuration

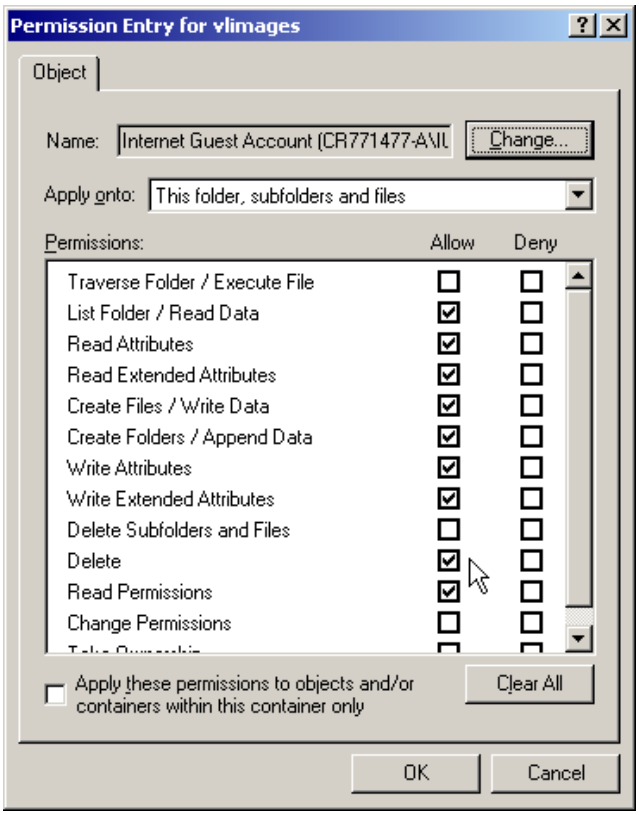
Permissions – vlimages directory (write & delete)

When a internet user 'hits' the VIEWLOG web pages, IIS uses the default account 'IUSR' which is the Internet Guest Account. This user and its permissions control what is allowed by the VIEWLOG Web Server. In order to operate, the VIEWLOG web server needs to create new image files in the vlimages directory. Therefore, the IUSR account needs to have '**write**' privileges on this directory. An example is shown below.



VLimages Properties

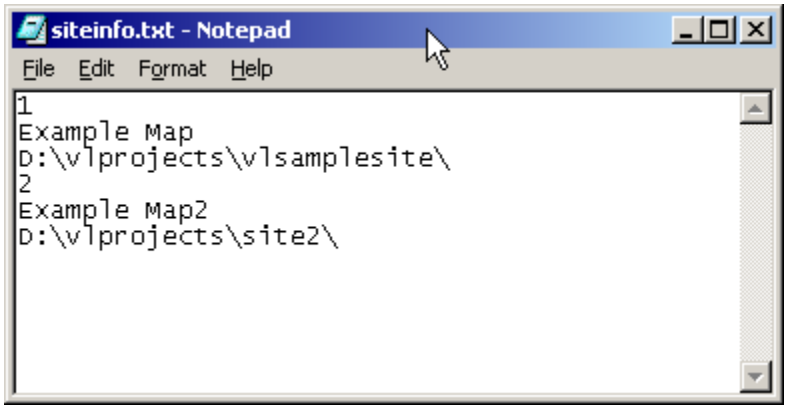
In addition, the VL web pages will automatically clear out old image files if the IUSR account has **delete** permissions on this directory. Delete permissions can be given by going into the 'Advanced' menu. An example screenshot is shown below.



Permission Entry for VLimages

SiteInfo.txt

The SiteInfo.txt file is located in the vlwebserver/vlusersetup directory and is used to tell the VL Engine where the VL Project Files are located. Its structure is quite simple and the webmaster can edit this file with any text editor such as NotePad or TextPad. An example SiteInfo.txt file is shown below. This example points to 2 project directories.



Editing Siteinfo.txt with a Text Editor

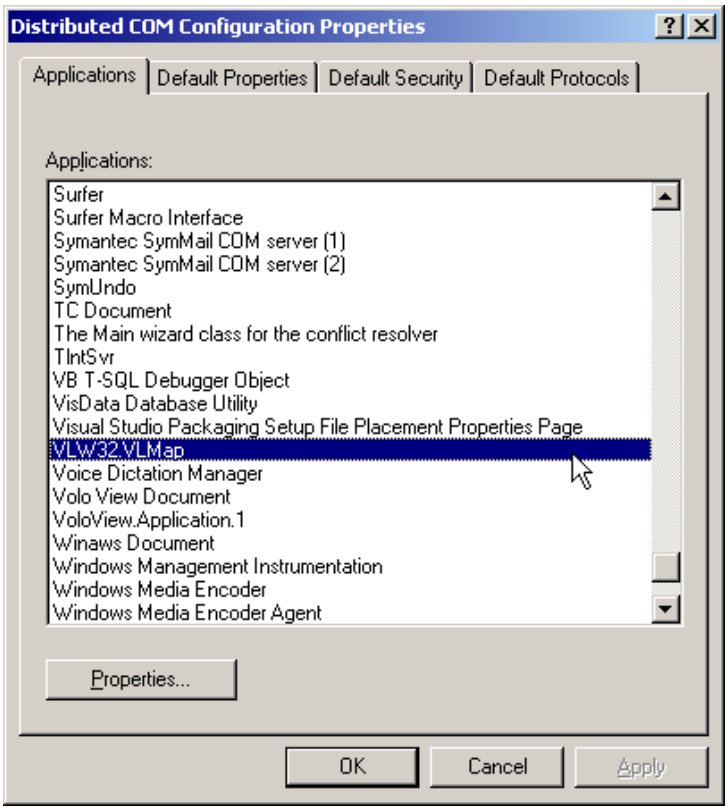
Any number of VL Project directories can be specified in the SiteInfo.txt file. On the web pages, the VL Projects will be listed in the 'Site' drop down list. There are three lines in this file for each project, as follows:

- Line 1: The project number. Sequential, starting at one.
- Line 2: The project name as it will appear on the website.
- Line 3: The path to the project directory (the directory that contains the base map *.map file) from the web server.

COM Configuration

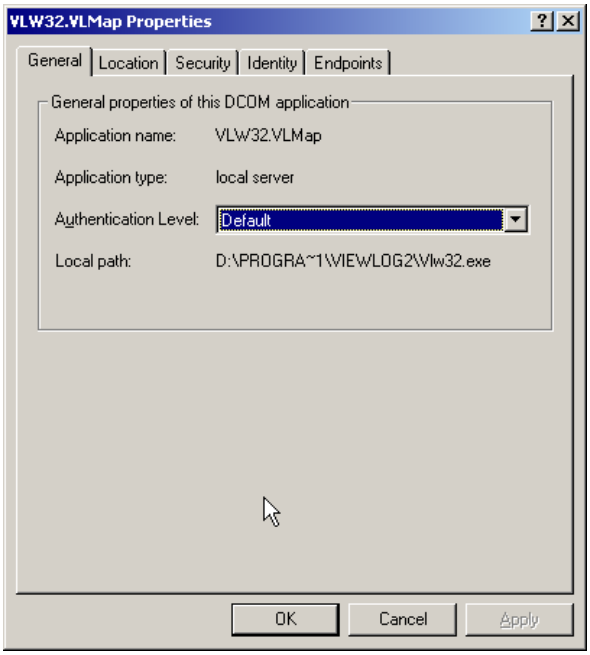
VIEWLOG is a COM object and needs to be configured so that it will work properly with the VIEWLOG web pages. Only a few changes are required to configure the VL Engine.

Open the COM Configuration Menu by typing **dcomcnfg** at Start > Run in Windows. The following menu will appear.

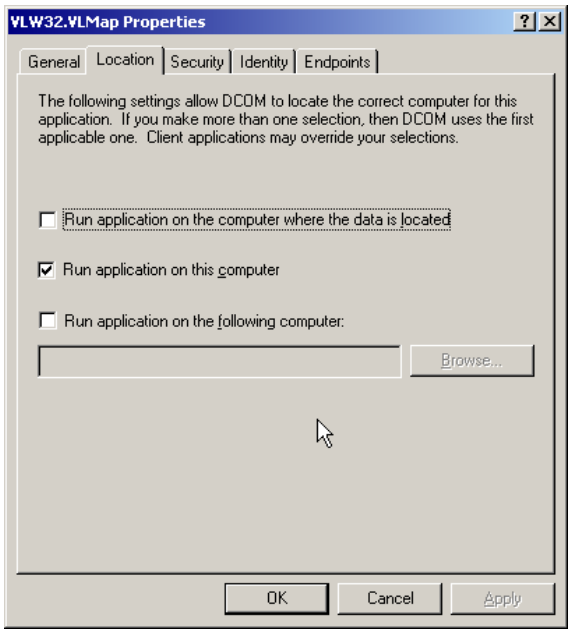


COM Configurations

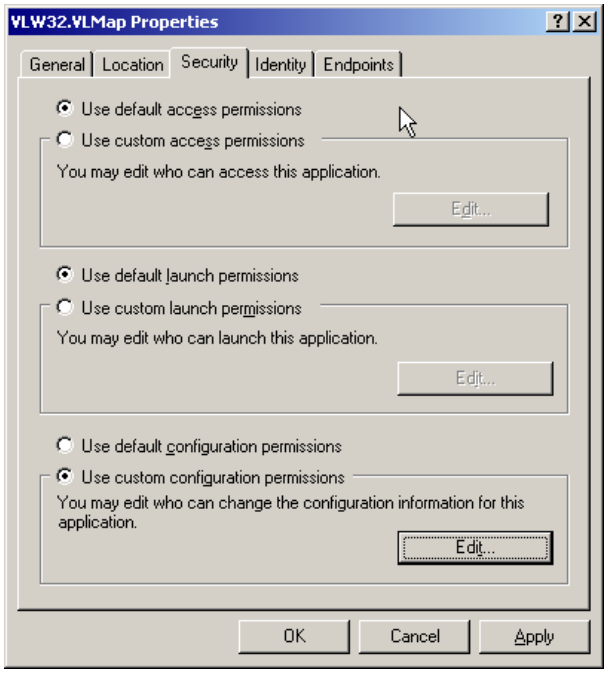
Scroll down to VIEWLOG. It is identified as **VLW32.VLMap** and click properties. Look at the following screenshots and make sure your settings match. Feel free to experiment which more restrictive settings if desired, but be prepared to fully test all features of the VIEWLOG web pages before leaving these settings in effect.



VLW32.VLMAP Properties – General Tab

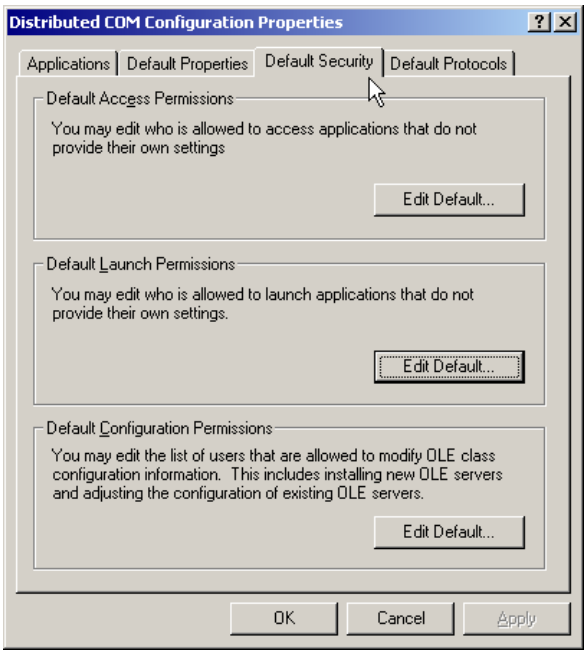

VLW32.VLMap Properties
General
Location
Security
Identity
Endpoints
The following settings allow DCOM to locate the correct computer for this application. If you make more than one selection, then DCOM uses the first applicable one. Client applications may override your selections.
Run application on the computer where the data is located
Run application on this computer
Run application on the following computer:
Browse...
OK
Cancel
Apply

VLW32.VL>MAP Properties - Location Tab



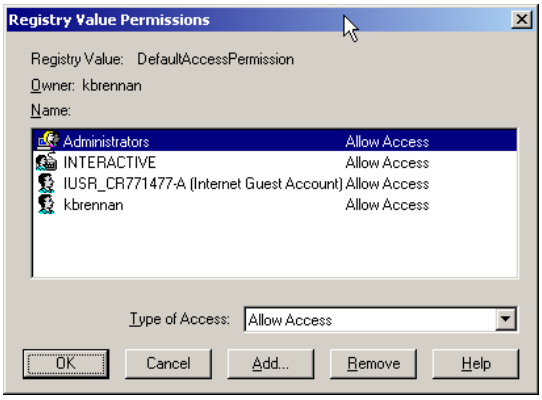
VLW32.VLMAP Properties - Security Tab

Security permission for this application can be either default or custom. Custom permission are set here while default permissions are set on the initial dcomcnfg screen under the security tab, shown below.

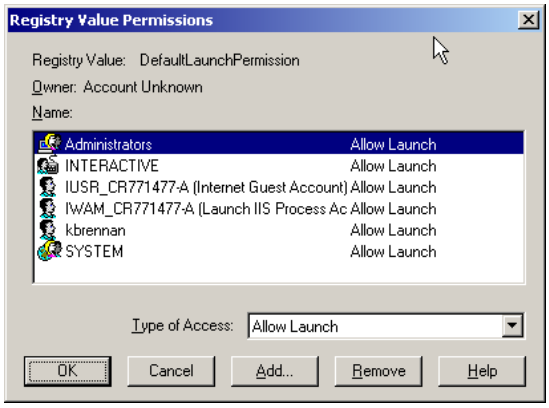

Distributed COM Configuration Properties
Applications
Default Properties
Default Security
Default Protocols
Default Access Permissions
You may edit who is allowed to access applications that do not provide their own settings
Edit Default...
Default Launch Permissions
You may edit who is allowed to launch applications that do not provide their own settings.
Edit Default...
Default Configuration Permissions
You may edit the list of users that are allowed to modify OLE class configuration information. This includes installing new OLE servers and adjusting the configuration of existing OLE servers.
Edit Default...
OK
Cancel
Apply

Default Security (not under VLW32 properties)

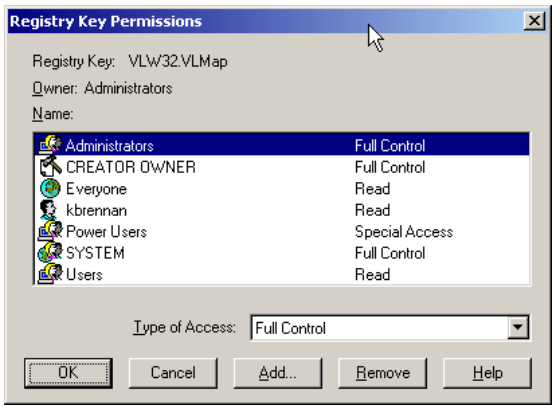
Regardless if custom or default permission are selected, the users that must exist (with the exception of the kbrennan account) are as follows:



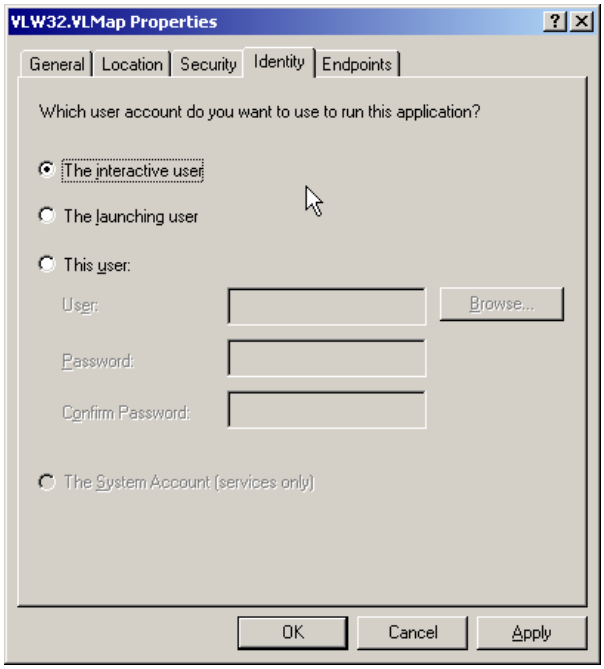
Access Permissions



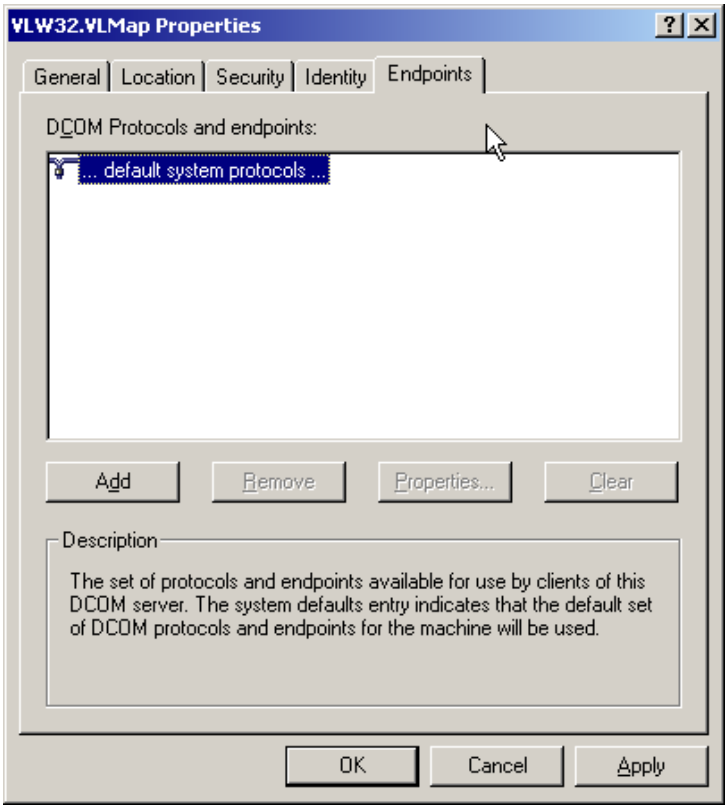
Launch Permissions



Configuration Permissions



VLW32.VLMAP Identity Tab



VLW32.VLMAP Endpoints Tab

Common Tasks

This chapter covers common tasks that are required once the server is up and running.

Preparing a Map for the Web Server

There are some important considerations that should be understood to ensure that internet users that hit the web server URL have a enjoyable and satisfying experience when working with the web pages.

Map Views

Make sure you have created at least one Map View, as this is how the internet users will bring up predefined maps. By default, when the internet user loads your map the first Map View will automatically be loaded. Be sure to have an appropriate first Map View. For example, in some cases the first Map View will have no data sources active (ie. no locations displayed) so that the initial map will open quickly. Be sure to use descriptive names when naming map views as this is the name users will select from in their web browser.

Page Layers

Create a 'page' view layer and save your Map View with this layer on so that when the internet user switches from World View to Page View, they will see a title block.

Automatically Adjust World Viewport Flag

Turn on the 'automatically adjust world viewport' flag under page setup and resave appropriate Map Views with this flag on. This will ensure that when the internet user switches from world view to page view that they will see the same zoomed in region in page view.

VIEWLOG Data Sources

When an internet user clicks on a map location while in investigate mode, the user will get a table of properties pertaining to that location. This table is generated from the query used to make the active VIEWLOG Data Source. Add (or Delete) as many fields as you deem appropriate to the data source queries before publishing your map.

Header Files / Logs

When an internet user clicks on a map location while in investigate mode, they are given an opportunity to view the header file for that particular location (ie. the View Log button). Make sure your VIEWLOG data sources have an appropriate header file linked to the data source for this feature. In most cases you should create a specific Map View just for viewing logs. You map have one Map View for each type of log you want your Internet users to have access to.

Cross Sections

When the internet user interactively makes a two point cross section in their web browser, the VIEWLOG web server will create a section based on the currently active Map View. In most cases you should create a specific Map View just for generating cross sections. Use the **Default Display** flag on the **Section** tab for each parameter to determine if that parameter should automatically be turned on when generating a cross section.

Databases and Linked Files

One of the trickiest parts of moving your VIEWLOG project from your local PC to the webserver PC is ensuring that when your project is opened on the webserver PC (by the internet user) that all the project files are still linked. For example, if you have an Access database that links in tables from another Access database (eg. 'C:\database\master.mdb'), when you move your project to the web server, it will be looking for a database in C:\database\master.mdb on the web server. If that database does not exist in that same path, the VIEWLOG Project will not work properly. Make sure you use a linking strategy that makes it easy for you to move your projects to the web server. For example, set up identical drive names, directories and paths on your local PC that exist on the web server.

Making a Project Public

This task will cover what you need to know to make your VIEWLOG Project public. In most cases, you will have a project on your local PC which you want to make public on the VIEWLOG Web Server.

Step By Step

1. Make sure you have read the **Preparing a Map for the Web Server** section
2. Save your VIEWLOG Project on your local PC.
3. Copy your VIEWLOG Project directory to the web server. If copying the files seems to take too long, check with your IT group to determine if there is an alternative to the method you are currently using. For example, a higher speed network card could make all the difference.
4. Add the path to your project into the SiteInfo.txt file. Locate the siteinfo.txt file in the web server directory of your choice. Add three lines of text to the end of the siteinfo.txt which describes the number of the project, the project name as it will appear on the website and the path to the project directory from the web server. Refer to the **Configuration** section of this manual if you required more details on editing the SiteInfo.txt file.

Applying Software Updates – VL Engine

Since VIEWLOG has already been installed on the web server once, and the hardware key is already attached, installing an update to VIEWLOG engine is simple.

Step By Step

1. Ensure that you are logged on to the web server as an administrator (if required).
2. Start the VIEWLOG installation executable by double clicking on the installation exe file (VLW2.exe or VLW2patch.exe).
3. Follow the on-screen instructions. In most cases, the defaults can be assumed.
4. Reboot the computer if required.

Applying Software Updates – VL Web Pages

Updates to the web pages are not performed by an installation executable, but by simply copying the new files to the correct folders. In most cases you are overwriting existing files. **There are**

three directories which you will never want to overwrite. This includes vlusersetup, vlusertheme and vlimages. These directories have files that have been edited to meet your organization needs and includes things such as the appearance of the web pages and the paths to the VIEWLOG project directories.

Step By Step

1. Backup your existing web server directories.
2. Unzip or copy the new VIEWLOG web pages to a temporary directory. There will be two directories: New Installation and Upgrade.
3. Open the Upgrade folder. This is the folder you will use to update the server's web pages. Inside there is one folder called vlwebserver.
4. The default name for the web directory is vlwebserver. On your web server PC you may have already renamed this directory to something else. This is fine if you have renamed your directory. Just think of it as having the name vlwebserver for the rest of upgrade instructions.
5. Go into the vlwebserver directory for both the new files and your existing web server directory. You should notice that from this point forward that the directory structure is identical for both with the exception that the vlusertheme, vlusersetup and vlimages folder is missing for the new files. This is to prevent you from accidentally overwriting your existing folders and folder permissions.
6. Copy all files and folders from the vlwebserver directory to your web server directory and overwrite any files when prompted.
7. Test the new files using your web browser.

Changing the Appearance of Web Pages

VIEWLOG has attempted to move all options concerning the look and feel of the web pages to the vlusertheme directory. Refer to the section **Web Structure Breakdown – vlwebserver Files** to learn about each of the vlusertheme files and how they are used.

Be aware that if you change files that are not contained within this folder that your changes will likely be overwritten when new versions of the files are updated on your web server. If you find an option that you would like to change that is not in this directory, please contact VIEWLOG first and we would be happy to work with you to move this option to vlusertheme directory.